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I. D. 1218

A HANDBOOK OF  
THE ANGLO-EGYPTIAN  
SUDAN

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1922

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NAVAL STAFF,

Naval INTELLIGENCE DIVISION.





## NOTE

THE material embodied in this book was collected towards the end of the Great European War. On the dispersal of the section a few months after the Armistice, the business of getting it through the press was entirely suspended. A year later it was decided that the book should be proceeded with, but exceptional difficulty attended its completion. The Editor, having resumed his normal occupation, had only time taken from his leisure in which to bring the material for this, and two other handbooks, into shape; most of the work had to be done at a great distance from assembled authorities, and communications relative to the contents passing between London and Khartoum or between individuals in this country led to considerable delay. The book remains substantially the embodiment of the material originally collected, although here and there considerable additions have been made, and it does not profess to be up to date. It may be noted that the incorporation of material received from Khartoum, when the book was actually in page proof, led to some disturbance of the text and a few inaccuracies in the index. It is hoped that the defects of the book may be leniently considered, and that it may be found to be a valuable, comprehensive survey of the Sudan and its affairs. Indebtedness has to be expressed to the Admiralty and to the Foreign Office for the assistance so readily accorded, and very specially to Sir Reginald Wingate, K.C.M.G., for the interest he took in the work and the encouragement he gave the Editor. In the work of compilation much valuable information and many useful suggestions were received from the officials of the Sudan Government, particular thanks being due to Mr. Hewins, Chief of the Economic Department, Captain MacMichael, Intelligence Department, and Mr. F. P. Osborne, Judge of the High

Court. The names of others who rendered valued assistance include Sir A. L. Webb, K.C.M.G., Sir Murdoch MacDonald, K.C.M.G., Colonel A. Balfour, D.S.O., and Professor Seligmann.

The general map of the Anglo-Egyptian Sudan (1:3,000,000) prepared by the Geographical Section of the General Staff was found extremely useful. The following maps or portions thereof were also used in the preparation of the work: Ordnance Survey 1:250,000; W.O. 1:1,000,000; W.O. Kordofan 1:5,000,000; W.O. Nile Valley 1:150,000. In addition many sectional maps have been utilized too numerous to mention, some of which appeared in the Geographical Journal or were Government surveys.

Practically all the available works on the Sudan were consulted. The basis was naturally laid by Count Gleichen's *Anglo-Egyptian Sudan*, 1905, and among others that were of importance were Sir W. Garstin's *Report upon Upper Nile, &c.*, 1904; Captain H. G. Lyon's *Physiography of the Nile and its Basin*, 1906; Captain H. A. MacMichael's *Tribes of Northern and Central Kordofan*, 1912; Mr. Peacock's *Land Settlement in the Gazira*, 1913; Messrs. A. Balfour and R. G. Archibald's *Review of Recent Advances in Tropical Medicine*. The numerous Government publications were of much assistance, including the Governor-General's Annual Reports, the Reports of the Central Economic Board, the Irrigation Department's Reports, the Intelligence Department's Handbooks on Kordofan and Bahr el-Ghazal. Among periodical publications material was found in the *Journal of the Geographical Society* and the Reports of the Wellcome Tropical Research Laboratory.

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# CHAPTER I

## DESCRIPTIVE GEOGRAPHY

### Provinces—Frontiers.

THE Anglo-Egyptian Sudan lies approximately between lat.  $22^{\circ}$  N. and lat.  $4^{\circ}$  N. and between long.  $21^{\circ} 30'$  E. and long.  $30^{\circ}$  E.

Its approximate area, since the incorporation of Darfur in 1916, is over a million square miles, an area about a third of that of Europe and twice that of Germany and France added together. It measures roughly 1,300 miles from north to south and, at its greatest width, over 1,000 miles from east to west.

### PROVINCES

The Sudan is divided into fifteen Provinces and one Military District as follows :

Halfa, on the Egyptian frontier, 112,300 square miles.

Berber, to the east of the Nile, from the Egyptian frontier to Khartoum, 97,100 square miles.

Red Sea, the coastal mountains and plain, 27,800 square miles.

Dongola, west of the Nile between Halfa on the north and Darfur and Kordofan on the south, 124,300 square miles.

Khartoum, at the junction of the White and Blue Niles, 5,000 square miles.

White Nile, the river zone between lats.  $12^{\circ}$  and  $15^{\circ} 30'$  N., 14,700 square miles.

Blue Nile, the east Gezira and river zone to about  $16^{\circ}$  N. 12,000 square miles.

Kordofan, the central region west of the White Nile and north of the Bahr el-Ghazal, 119,000 square miles.

Nuba Mountains, between south Kordofan and Upper Nile, 34,000 square miles.

Kassala, on the east frontier between lats.  $13^{\circ}$  and  $17^{\circ} 30'$  N., 46,000 square miles.

Fung, ex Sennar, the region west of the White Nile between lats.  $9^{\circ}$  and  $14^{\circ}$  N., 38,700 square miles.

Upper Nile, the river zone between lats.  $8^{\circ}$  and  $12^{\circ}$  N., 36,000 square miles.

Bahr el-Ghazal, between Kordofan and the south-west frontier, west of the Nile, 114,100 square miles.

Mongalla, between lat.  $6^{\circ}$  N. and the Uganda frontier, 63,800 square miles.

Darfur, between Kordofan and Wadai, 145,400 square miles.

Sobat-Pibor (Military District), between the Bahr el-Jebel and the Abyssinian frontier north of lat.  $6^{\circ}$  N., 24,004 square miles.

## FRONTIERS

### *Northern*

The Sudan is conterminous on the north with the southern frontier of Egypt. The political boundary was fixed by the Anglo-Egyptian agreement of 1899 at the twenty-second parallel, but the administrative boundary has been varied from that line in order to secure the inclusion of certain tribes. It is this administrative boundary that is now described. Its western extremity in the Libyan desert has not been fixed. North of Wadi Halfa it extends to Faras Island, 20 miles north. At the Wadi Gabgaba it dips south-east to Jebel Batarzuga (lat.  $21^{\circ} 42'$  N., long.  $33^{\circ} 33'$  E.), where it turns sharply north-east to Jebel Muosim, passing through Bir Tawil, east trending to north to Jebel Umeltiur el-Fokani, north-north-east to Jebel Niorub el-Fokani, east-south-east to Jebel Meneiga, thence north-east to Bir Shalatein on the Red Sea coast (lat.  $23^{\circ} 10'$  N.).

### *Eastern*

The eastern boundary is formed successively by the Red Sea coast from Bir Shalatein to Ras Kasar (lat.  $18^{\circ}$  N., long.



38° 36' E.); by the frontier of the Italian colony of Eritrea and by that of Abyssinia.

The Sudan-Eritrean frontier line, as settled by the agreements of 1898 and 1901, rectified in 1903, runs in a general south-south-west direction, via Jebel Halibai (440 ft.), the police posts on the Khor Karora, Jebel Kirbagha (930 ft.) and Jebel Tafleinai (2,424 ft.), where it turns west to Jebel Dambobiet. Thence it runs south over the crest of the Dob Mountains to the Katai Dob Pass, thence running west, following the northern edge of the Hagar Nush plateaux, via Katai Mashonkole, and skirting the Jebel Adrau (8,305 ft.) to south, till it strikes the Khor Hafta. The line follows the course of the Hafta as far as Jebel Mahatam (lat. 17° 30' N.), where it turns south along the crests of a range of hills for about ten miles to Jebel Adalau. Thence it turns west until it cuts the confluence of the Ambakta and Baraka (Barka), after which it follows the course of the Baraka and its tributary the Dada, and rounding the head-waters of the Khor Harnai Id, runs south along the successive ridges of the Jebel Askenab (4,664 ft.), Jebel Koreb, Jebel Adobana and Jebel Tiaiye. These ranges rise to heights varying from 3,000 to 5,000 ft. and form the watershed between the Baraka on the east and the Gash and Langeb on the west. Passing to east of Maman, the line runs south-west, across the summits of Jebel Benifer (3,434 ft.), Jebel Afodgumbib (3,320 ft.), Jebel Berinnis (4,000 ft.), the Sabderat range east of Kassala, Jebel Anderaib (2,344 ft.), Jebel Abu Gamal (3,054 ft.). From this point it turns due south to Umbrega (Um Hagar) at the junction of the Khor Royan with the Setit (Takazyé) where the Eritrean and Abyssinian frontiers meet.

The Sudan-Abyssinian frontier, as settled by the treaty of 1902, runs at first in a general south-south-west direction. Crossing the Bahr el-Salam at a point some 10 miles south-west of Nogara, it runs via Jebel Luban, Jebel Nahut and Jebel Abu Takia to Gallabat (Metemma), just south of the thirteenth parallel. There it turns almost due south to the Jebel Magbara, thence west, via Jebel Wad el-Mek, for

35 miles till it crosses the Rahad at Meshra Haskanit. After following the course of the stream for a few miles, it then turns south-west passing round the east side of Jebel Halawa, Jebel um Doga and Jebel el-Mutan to the River Dinder. After crossing the Dinder near Jebel um Idla it continues, still in a south-west direction, to Jebel Wizwiz (Withwith). Here the frontier turns almost due south, crossing the Blue Nile east of Famaka near Bumbode, thence south-south-east to the summit of Jebel Kako. It then turns south again, leaving Jebel Falabut and Jebel Faronge to west, till at Belad Deroz (Customs Post) it turns north-west to Jebel Kashangaru (1,285 ft.). Here it turns again south-west via Jebel Gambeila to Kurmuk, and, skirting Jebel Jerok on the east side, runs south to Jebel Taza, thence south-west via Jebel Us (just north of the tenth parallel) and Jebel Gogot to Jebel Manga; here it trends very slightly eastward to Jebel Gemi (6,840 ft.), thence almost due south to a point east of Abajala on the Khor Garre or Jokau. The frontier now follows the course of this river and of the Baro, as far as the junction of the latter with the Pibor, from which point it turns south-west along the Pibor to Akobo Post, whence it proceeds in a south-east direction along the Akobo. It then follows the Khor Kaia south-east to Kutul Birino, just south of the intersection of lat.  $6^{\circ}$  N. with long.  $35^{\circ}$  east, beyond which it passes for some 30 miles before turning first south then east to the Khor Kibish. It then follows the course of the Kibish to the point at which that river empties itself into Lake Rudolf, i. e. the centre of its north-west bay, known as the Sanderson Gulf. The Sanderson Gulf is in some seasons merely a lagoon surrounded by cultivated lands. Some sections of the latter part of this frontier, e. g. between Abajala and Kutul Birino, and along the course of the Kibish, have not yet been formally delimited.

### *Southern*

The southern frontier of the Sudan, which is conterminous with that of the Uganda Protectorate, runs due west for

some 110 miles from the southern extreme of the Sanderson Gulf north of Mt. Lubur to the north of Jebel Mogila, whence it turns in a south-west direction passing by the north-west of Jebel Zulia to the south of Jebel Harogo (4,450 ft.). Here it turns west and passing north of Jebel Latome, leaving the Loggire Hills and Jebel Mommoi on the north, runs as far as the north of Jebel Tereteinia. Here it turns south as far as Jebel Tiya and then west to Jebel Langia. From here it runs in a south-west direction to Jebel Ilala and continues to Jebel Aggu, thence in a west direction to Jebel Matokko (Batogo), this hill being in Uganda. From Jebel Matokko the line runs approximately south-west to Lokai, thence following the Assua River to a point west of Jebel Kadomera. From here it runs to the top of Jebel Ebijo (Edijo) and then follows the Unyama River for some 10 miles to Nimule, 100 miles north of Lake Albert. Nimule is the extreme south point of the Sudan. Here the line turns north-west along the Bahr el-Jebel to the mouth of the Kaju River, then follows the Khor Nyaura to its source, thence to a point not yet determined on the River Kaia, the south-west course of which it follows to the Nile-Congo watershed.

### *Western*

The western boundary of the Sudan is formed successively by the Belgian Congo and by French Equatorial Africa; the frontier line runs in a general north-west direction, at first following the Nile-Congo watershed; it was agreed upon by the treaty made with Belgium in 1894 and confirmed in 1906.

Starting from the Kaia, at a point approximately lat.  $3^{\circ} 30' N.$ , long.  $31^{\circ} 30' E.$ , the frontier line at first follows a range of hills (Jebel Rego, Jebel Kimba) to north, then turns west, keeping to the south of the head-waters of the Yei and its tributaries. Some 3 miles before passing east of the village of Lomago it turns north slightly trending towards east to lat.  $3^{\circ} 45' N.$ , whence it runs, with various minor curves, in a north-west direction following the formation

of a line of hills. It skirts to south the villages of Gadamuke and Libogo and to north that of Doko. From Doko it passes the hills Olituru and Buda and runs to east of Jebel Wivu (3,878 ft.), leaves Jebel Mashikidi to the south and the village of Elimiri on the north, passes to east of Jebel Manda and reaches the Khor Toreh. It then curves north-east to lat.  $4^{\circ} 30' N.$  after which it again turns north-west to Jebel Merri, where it dips south-west to Jebel Nyimboa. Hence it continues north-west to a point south of Jebel Obo, whence it strikes almost due west to Yembi (Ambeh). Crossing the southern slopes of the Jebel here, it dips south-west for about 10 miles, and then runs westward, with various curves and bends, following the formation of the hills that divide the streams flowing into the Bahr el-Jebel on the north and east from those flowing into the Mbomu on the west and south. The frontier line crosses the north slopes of Jebel Barginzi (Baginse, 2,953 ft.), skirts the old fort of Nambia and the head-waters of the Yakaluku, and turns north and skirts the village of Zungumbia (lat.  $4^{\circ} 30' N.$ ) to the south. It then runs in a general direction to west still following the line of the hills. Passing south of the head-waters of the Wo and its tributaries, and of the village of Senango, the frontier curves south-east and then south-west to the villages of Waraga, Nubisui, Voza, and Bomoi. Hence it runs westward, slightly trending to north, keeping south of the head-waters of the Yebbo and its tributaries. It then turns first north, then west, running approximately parallel with the course of the Khor Tau, to the village of Sheikh M'Bitima, where it makes a short dip to south, turning again north-west towards the village of Sheikh Kana, which it leaves to the west. A few miles on it strikes the Khor Bombuka, a tributary of the Lingassi, and here makes a short bend to north-east, keeping to west of the Belgian post known as Sultan Doruma. At lat.  $4^{\circ} 45' N.$  it strikes the Gurba River, and then runs north-west between two other streams, the Yubo to north and the Werre to south. A little before it reaches the village of Sheikh Masungwa, it turns west and then again north-west,

running to east of the Khor Sugbwa and of the villages of Sheikh N'Guku, Sheikh Gazwa, and Sheikh Mekka, till, at a point just north of lat.  $5^{\circ}$  N. it strikes the river Mbomo (Mbumu) and the Franco-Belgian frontier.

The frontier between the French zone and the Sudan was settled by the agreement of 1899. From lat.  $5^{\circ}$  N. to lat.  $11^{\circ}$  N. the watershed of the Nile and of the Congo and their affluents divides the French Congo (Haut Oubangi) from the Bahr el-Ghazal Province. About lat.  $9^{\circ} 15'$  N. the frontier line passes some 80 miles to west of Kafia Kingi (Kangi), head-quarters of a district of the Bahr el-Ghazal Province. Between the eleventh and the fifteenth parallel it runs north-north-west in general and forms the frontier between Darfur on the east and Wadai on the west; these two states, independent until recently, now form part of the Sudan and French zone respectively. By the Anglo-French agreement of 1899, it was arranged that this frontier should in no case be so drawn as to pass to the west beyond long.  $21^{\circ}$  E. or to the east beyond long.  $23^{\circ}$  E. Accordingly the district of Dar Sula was left to the French zone, the districts (from south to north) of Dar Simyar, Dar Tama, and Dar Gimr, to Darfur. The French map of 1915 shows the district of Dar Masalit, lying west of the Wadi Azunga and Wadi Kajja, between Tuntuma to north and Iffene to south, as in Wadai. In 1916 the Sudan government fixed a frontier post at Kareinik (approximately long.  $12^{\circ} 30'$  N., lat.  $23^{\circ}$  E.) on the Wadi Barei, near the old Egyptian post of Magorni. By the agreement already quoted, the line from Billia (lat.  $16^{\circ} 30'$  N., long.  $23^{\circ} 30'$  E.) was to run north-west to the point of intersection of the Tropic of Cancer with long.  $16^{\circ}$  E.; this line is purely artificial and, running as it does through the desert, is never likely to be exactly delimited. By a supplementary Convention of 1919, it was stated, in amplification of the agreement of 1899, that the line of frontier should start from the point where the boundary between the Belgian Congo and French Equatorial Africa meets the water-parting between the basin of the Nile and that of the Congo. It should follow

in principle that water-parting up to its intersection with lat.  $11^{\circ}$  N., and should run to approximately the junction of the Wadi Azum with the Wadi Kaja. Thence it should follow the Wadi Kaja to its junction with the Wadi Azunga, and thence the Wadi Azunga to a point north of Jebel Kudri to be fixed by the Boundary Commission. There the boundary should turn approximately north-east and following the boundary between Tama and Masalit, pass between Birrok and Jebel Om. Thence it should follow the eastern boundary of Dar Tama to a point east of Abu Asal and west of Um Ganatir and continue along that boundary to the northernmost point of contact between Dar Tama and Dar Gimr. From that point it should run to Undur, and thence in an approximately northern direction to the Wadi Howa, passing in the neighbourhood of Orba wells, which should be included in the French sphere. After joining the Wadi Howa the boundary should follow the wadi in principle eastwards as far as the eastern limit of the French sphere, namely long.  $24^{\circ}$  E. In certain circumstances it was agreed that the British Government would not object to an extension of the French sphere of control to the north of Wadi Howa. The eastern limits of such extension not to go beyond long.  $24^{\circ} 30'$  E.

## CHAPTER II

### PHYSICAL GEOGRAPHY

General features—Surface (Northern zone, including coast ; Intermediate zone ; Tropical zone)—Rivers (The Nile ; Nile tributaries ; Independent rivers)—Vegetation—Geology.

#### GENERAL FEATURES

THE Anglo-Egyptian Sudan is a plain, with a general elevation above sea-level of 1,100–1,200 ft., and cut through in the centre from south to north by the Nile. This forms the connecting link between the northern, intermediate and southern zones into which the country may be said roughly to fall. The plain is bounded to the west by the hills of the Nile-Congo watershed and the highlands of Darfur, to the east by the Abyssinian hills and their continuation in the Red Sea range. From about lat. 12° N. northwards these hill systems retreat farther and farther from the river, and the plain correspondingly increases in width from south to north, finally becoming continuous with the Sahara. The Sudan presents a great variety of physical features—waterless deserts, stony or bush-covered uplands, dense forests, grasslands or savannahs, and impenetrable swamps.

The *northern or desert zone* north of lat. 16° N. consists largely of barren, rainless desert. To the west of the Nile are the Libyan and Bayuda deserts, a continuation of the north African Sahara ; to the east of it is the Nubian desert, a continuation of the Arabian. Towards the Red Sea this desert gives place to the foothills of the range of mountains which runs parallel with it about twenty miles distant from the coast. This range joins the Abyssinian escarpments in the south ; its peaks attain a height of from 4,000 to over 7,000 ft. A sandy belt stretches between them and the



coast. The Atbai, or eastern part of the Nubian desert, can be cultivated in places, owing to the water found in the Khors and to the heavy rains which occur at intervals from August to January inclusive, particularly among the hills. Cultivation is also carried on in the oases of the western desert, such as Selima, Lagia and Bir Natrun, where wells exist. The Nile banks are cultivated in many places, notably at Dongola and Merowe; the strips seldom extend to a greater depth inland than one to three miles, and often cover only  $\frac{1}{4}$  mile. The loop enclosed by the Nile and the Halfa–Abu Hamed Railway is a desolate plain of sand and shingle, bordered to east and west by chains of low hills.

The *intermediate or transitional zone* lies between lat.  $16^{\circ}$  N. and lat.  $11^{\circ}$  N. On the west of the Nile the desert country extends farther south than it does on the east, the latter district being well watered by the streams coming down from the Abyssinian highlands, and having a heavier rainfall. The rainy season proper on the Upper Blue Nile and Atbara begins within a fortnight (one way or the other) of the second week in June and lasts until the middle of September; there are light rains in January and February, and sometimes heavy rains in October and November. Khartoum has usually about 15 days' rainfall only in the year, between the middle of June and September. (See farther under *Climate*, p. 605 seq.)

West of the Nile extend the vast upland steppes of Kordofan and Darfur, which, though arid, allow of cultivation in places. The rainy season in Kordofan is June to September, in Darfur, July and August. In Kordofan the plains are broken by isolated hills about 2,000 ft. in height; in Darfur the hills become more mountainous in character, attaining in the central Marra massif a height, according to the latest estimate, of over 9,000 ft.

The central and eastern districts of the intermediate zone are the most productive of the whole Sudan; they include the fertile tracts round Khartoum, Tokar, Kassala, and Gedaref; the plain of the Gezira, between the Blue and

White Niles ; the southern part of the so-called 'Island of Meroe' ; the arable and grazing lands of the country stretching along the upper courses of the Blue Nile and Atbara to the Abyssinian frontier, including part of Sennar Province.

The *southern or tropical zone* lies south of lat.  $11^{\circ}$  N. With the exception of the southern group of the Nuba Mountains it consists, down to about lat.  $4^{\circ}$  N., of a vast, level plain, covered in parts with forests, in parts with swamps and grasslands. In the south-west the plain rises to the highlands of the Nile-Congo watershed, about 2,000 to 3,000 ft. in height. In the extreme south, just north of the Uganda border, between lat.  $5^{\circ}$  N. and lat.  $4^{\circ}$  N. and long.  $32^{\circ}$  E. and long.  $33^{\circ}$  E., are some high mountains of the Lafit and Latuka district. They are mainly of granite and gneiss, and some of the heights attain 7,000 to 9,000 ft.

West of the Nile, and especially between the Bahr el-Ghazal and Bahr el-Jebel, stretches a swamp, filling a depression that is believed by some authorities to be the bed of an ancient lake, now silted up and converted into a morass by the washings of the innumerable streams which descend to it from the south-west plateau. Lake No may be a small survival of this lake. The upper course of these streams lies through park-land country and their valley-slopes are covered with forests ; the western slopes of the Abyssinian plateau are also forest-covered. A great part of the Sobat-Pibor and Mongalla districts consists of marshy grassland, which becomes parched in the dry months. On the Uganda border this gives place to rising ground of the park-land type. Apparently the only desert land occurs near Lake Rudolf on the south-east frontier.

This southern zone falls wholly within the area of tropical rainfall.

The river system will be described in detail later. (See pp. 62-101, below). Besides the Nile and its tributaries (Sobat, Blue Nile and Atbara on the right bank, Bahr el-Ghazal on the left), there are two independent rivers of some importance, the Baraka and the Gash. These both rise in Eritrea, and

are torrential rivers ; they water Tokar and Kassala respectively, and enable grain and cotton to be grown. Khors and wadis in many parts of the country afford a precarious and intermittent water supply. These are referred to under the various divisions of the surface discussed below.

### SURFACE

The surface of each zone will now be described in more detail, starting in each case west of the Nile.

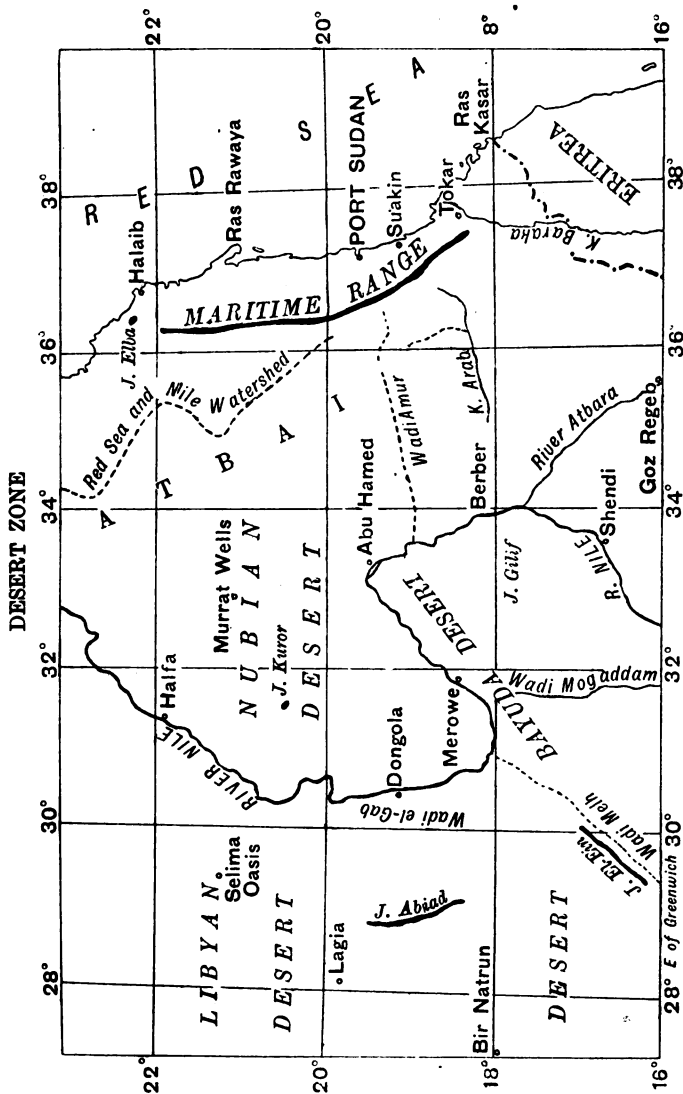
#### NORTHERN ZONE (INCLUDING COAST)

The northern zone may be divided as follows: (1) the country west of the Nile, including (i) the Libyan desert and oases (lat.  $22^{\circ}$  N. to lat.  $18^{\circ}$  N.), with the Wadi El-Gab, (ii) the Bayuda desert (lat.  $18^{\circ}$  N. to lat.  $16^{\circ}$  N.), with the Wadi Melh and Wadi Mogaddam ; (2) the country east of the Nile, including (i) the desert to west of the Halfa–Abu Hamed Railway (lat.  $22^{\circ}$  N. to lat.  $19^{\circ} 30'$  N.), (ii) the Atbai desert to east of the Halfa–Abu Hamed Railway (lat.  $23^{\circ}$  N. to lat.  $19^{\circ} 30'$  N.), (iii) the stretch of Red Sea coast comprised in Sudan territory (lat.  $23^{\circ}$  N. to lat.  $18^{\circ}$  N.), (iv) the district south of Suakin and Berber (lat.  $19^{\circ}$  N. to lat.  $16^{\circ}$  N.), with the northern part of the ‘ Island of Meroe ’.

With the exception of the Red Sea range this region presents very few salient features ; the hills are insignificant, and it mainly consists of monotonous desert intersected by valleys or khors.

#### *Country West of the Nile*

*Libyan Desert and Oases.*—The country north of Kordofan is entirely desert, except for the cultivated strips along the Nile. The Arbain road runs along a ridge traversing its northern portion, passing, from north to south-west, the oases (with wells) of Selima, Lagia and Bir Natrun (or Sultan). The desert varies from hard sand or gravel to dunes and sand-drifts which sometimes render the going difficult or



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even dangerous. There are rocky hills of limestone, granite, or basalt, and clumps of conical sand hummocks, from 10 to 50 ft. high, known as *terebil* (sing. *tarbul*). Few traces of animal or vegetable life are to be seen. The mineral resources have not been explored, but salt and natron are found in abundance round Bir Natrun, and some lignite has been found near Dongola. (See *Minerals*, p. 122.) Both here and to east of the Nile, as far south as beyond Khartoum, the soil is Nubian sandstone filling up the hollows of the old land surface and resting on older crystalline rocks; beds of clay are found among it. The sandstone is permeable, and water may be found either within a few feet of the surface, as at Selima, or at a depth of from 100 to 300 ft. Between Halfa and Sarras the masses of basalt and granitic rock have earned for the district the name of Batn el-hagar, i. e. Belly of Rocks. At Old Dongola, and again 4 miles below Merowe, the desert sandstone touches the right bank of the Nile and forms cliffs from 30 to 70 ft. high.

About 98 miles west of the Nile at Dongola is the northern extremity of the Jebel Abiad plateau; on the eastern side it is a high, steep bluff, exposing the gypsum from which it gets its name (white). On the west, it slopes gently down to the undulating plain round Bir Natrun. There are a number of isolated hills, or groups of hills, scattered over the desert and in the neighbourhood of the oases or near the river, e.g. Jebel Harrar and Jebel Atshan to south-east of Selima, Jebel Rahib to south-east of Bir Natrun. Some are of volcanic origin; some are conical, others round-topped. There is said to be a sulphurous lake, known as Tura el-Bedai, about 150 miles to south-west of Lagia.

*Wadi El-Gab*.—A noticeable feature of this northern desert is the Wadi El-Gab, a sandy depression running through the trough of a broader, rocky valley. It is about 125 miles in length, and averages five miles in breadth. It extends from Hannek (just south of the Third Cataract) to a point 26 miles due west of Old Dongola. Throughout this district there are stony plains and rocky hills; salt and

lime are found on the surface. Wells are numerous, many of them stone-lined and containing good water, and water is also found at a depth of from 9 to 20 ft. below the surface in many places. Great damage is done at times by sand-storms to the palms and acacias which grow here ; there are practically no pastures or cultivated lands.

*The Bayuda Desert.*—The desert to south of the above district, i. e. approximately between lat.  $18^{\circ}$  N. and lat.  $16^{\circ}$  N., is sometimes known as the Bayuda ; it is bounded on the north and east by the Nile, on the west by the Wadi Melh. The Bayuda desert consists of extensive sand or gravel plains, divided by ranges of low hills. The Jebel Gilif (3,500 ft.) is a precipitous granitic range south-east of Ambigol (Ambugol), broken up into outlying spurs (Jebel Magaga, Jakdul, and others), with intermediate plains ; rock-pools and wells are found in some of the ravines. Between Jakdul and Abu Tleh are two prominent hills, Jebel El-Nus and Jebel Sergein, rising from sand-drifts and masses of rock. South of Abu Negr, about lat.  $17^{\circ} 20'$  N., there are some treacherous sand-drifts.

Cultivation is possible in places during the rainy season, dura being then grown in the moist wadis. More land could probably be brought under cultivation, as the water-supply, from wadis, wells and rock-pools, is more plentiful than farther north.

*Wadi Melh.*—The Wadi Melh (El-Melik) is the bed of an extinct river, now forming a shallow depression from 10 to 30 miles wide, stretching for some 350 miles from Debba in a south-west direction to Um Badr in the north-west district of Kordofan. It holds water in pools for a short time after the rains and is generally moist enough to allow of grazing. Water is always to be found at the wells of Mahtul and Soteir, about 30 and 60 miles from Debba respectively ; at the former, it is slightly brackish. The western boundary of the Wadi, approximately between lat.  $17^{\circ}$  N. and lat.  $16^{\circ} 30'$  N., is formed by the rugged, uniform, almost perpendicular wall of rock known as Jebel Nagushush (Makakush),



about 450 to 500 ft. in height. El-Ein, about 130 miles from Debba, is a gorge in this, at about 60 miles from its northern extremity ; it is continued for a short distance to the south from El-Ein, and then curves away west and north from the Wadi in a horseshoe shape. The formation at El-Ein is a series of undisturbed sedimentary beds lying horizontally, most of them sandstones or grits. The much older series of gneisses and schists which underlie them are exposed along the foot of the Nagushush escarpment a few miles north of El-Ein. Water at El-Ein is good and abundant.

*Wadi Mogaddam.*—The Wadi Mogaddam (Mugaddam, Mokattam) extends from Korti southward to beyond Omdurman, a length of about 200 miles. This now dry watercourse shows every indication of having at a remote geological epoch formed the main branch of the Nile itself, which appears to have been deflected from its straight course through the Bayuda desert by the lavas and scoria ejected by the now extinct and mostly obliterated craters of the igneous groups of Magaga and Gilif (see above). Magaga culminates in a huge cone of red porphyry and the whole district thence to the head of the Wadi Mogaddam is strewn with erupted matter of great age. There are some good wells and cultivated lands at Gabra, nearly 60 miles northwest of Omdurman. As the level of the wadi here is below that of the Nile valley, it has been suggested that it might be possible to flood it by cutting a channel from the left bank of the White Nile, and thus to turn it into a valuable reservoir annually filled with surplus flood-water.

There are a number of lesser wadis and khors, some of which have not been yet surveyed, and several well-centres, e.g. Abu Halfa, Bayuda and Um Sideir, in the district south of Jebel Gilif ; Sania and Jura in the Wadi Kirbekan district ; and under Jebel Hamboti.

### *Country East of the Nile*

The Halfa–Abu Hamed Railway divides the desert to east of the Nile into two parts. It runs between steep hills, which

are sometimes detached, sometimes (especially on the eastern side) continuous ; they rise from 800 to 1,000 ft. above the sand or gravel surface of the plain. Where the railway crosses them, near No. 5 station, the elevation above sea-level is about 2,000 ft. Near stations 4 and 6, wells have been dug in the sandstone, at which a plentiful supply of water is obtained at a depth of less than 100 ft. The watercourses to west of the railway begin broad and end deep and narrow, whereas those to east of it begin with a narrow channel and become gradually broader, sandier, and of a gentler slope. Drifts of soft, deep sand are met with in places in the desert.

*Desert West of the Halfa-Abu Hamed Railway.*—The western of the two districts divided by the railway, that lying between it and the Nile, forms part of the Nubian desert. It has been little explored, and is very arid. In the centre rises Jebel Kuror (Kura), alt. 4,067 ft., with Jebel Mansur and Jebel Ibirik to the north and south-east respectively. Water is found among the rocks of Jebel Kuror for months after heavy rains, and there are wells sunk in hard granite, which has partly decomposed so as to be able to hold water. To west and south-west of No. 4 station are some peaks known as Jebel Kurush. Along the Nile, hills run from Wadi Halfa to Kerma, gradually diminishing between Kerma and Kosha, while from Jebel Barkal near Merowe to Abu Hamed there is a rough and rocky belt of low hills a few miles from the river. There is a little grazing and cultivation on this side of the river, but none inland in the desert. The rainfall is heavy, local, and at long intervals. In the northern part of the district it is carried off by a number of wide, shallow wadis, which may become dangerous torrents as their beds contract on reaching the rocky belt along the river. In the southern part of the district the chief drainage lines are the two wadis named Keheili, one of which rises near Jebel Kuror, the other near No. 5 station ; the railway follows the latter, which is continued under the name of Wadi Gaud ; both wadis eventually reach the Nile.

*Desert East of the Halfa–Abu Hamed Railway : the Atbai.*

The most northern part of the Atbai desert belongs to Egypt (lat.  $26^{\circ}$  N. to lat.  $23^{\circ}$  N.). Its Sudan elevation is from 1,500 to 3,000 ft. above sea-level. It includes the eastern part of the Nubian desert, but would be mistakenly spoken of as an entirely desert region ; there are a number of fertile wadis and khors where water is often to be found at 2 to 3 ft. under the surface, and where cultivation can be carried on. The Wadi Di-ib, for example, contains rich alluvial soil after the actual water has disappeared.

East of the railway the hills, as has been already said, become more frequent and considerable. . The watershed between the Nile and the Red Sea is formed by a confused mass of sandstone or granite hills, 30 to 40 miles in width, lying between long.  $34^{\circ} 30'$  E. and long.  $35^{\circ} 30'$  E., extending from Jebel Is (5,689 ft.) eastward to Jebel Eigat (both these peaks are north of lat.  $22^{\circ}$  N.), and trending in a general south-west direction from Jebel Is to about lat.  $20^{\circ} 45'$  N., when it curves south-east to about lat.  $20^{\circ}$  N. It is marked (from north to south) by several heights, among which may be named Jebel Teribesh (5,573 ft.), Jebel Mashushenai (3,364 ft.), Jebel Kam Howit, Jebel Onib (3,758 ft.), Jebel Abu Dueim. Immediately to east of the railway, between it and the watershed, and scattered over the central desert, are other hills, e. g. Jebel Rafit (about 2,500 ft.) and Jebel Nigeim ; both of these have ancient gold-workings.

The greatest heights are attained in the maritime range. This runs at a distance of some 20 or 25 miles from the coast and parallel with it, beginning in the north with Jebel Elba, inland from Haleib, and finally in the south joining the Abyssinian escarpments.

Among the more prominent peaks are (from north to south) Jebel Assotriba (7,281 ft.) to south-west of Mersa Bela ; Jebel Areitri (several peaks between 5,000 and 6,000 ft.) ; Jebel Erba (7,274 ft.), to south-west of Mohammed Gul ; Jebel Milangweb (5,470 ft.), Jebel Oda (7,412 ft.), Jebel Gomadliba (Gomadribab), (6,176 ft.), inland from Mersa Fijab :

Jebel Bawati (5,694 ft.) to south-west of Mersa Arus ; Jebel Sotriba (4,477 ft.) inland from Port Sudan ; another Jebel Erba (5,152 ft.) inland from Port Sudan. The ranges of Elba and Assotriba are composed of red granite ; small hills of hornblende porphyrite are found at the foot of the latter. The Erba range is reported to be auriferous ; extensive ancient quarries have been discovered. This range was explored by a traveller in 1896, who gives the names of three peaks of Erba as Nabidua, Sherbuk, and Emere, all over 7,000 ft., and describes gorges among them, with deep pools and running water, the surrounding country being arid and monotonous.

The hills in the northern part of the Atbai are intersected by numerous rocky khors, which feed a few large and, on the eastern side, well-wooded wadis. Of these, the Wadi Gabgaba has the longest course ; it has not been surveyed throughout, but rises somewhere south of Jebel Shigrib, and runs in a general north-west direction, with a number of affluents. To the north of lat.  $22^{\circ}$  N. the Gabgaba unites with the Alagi, whose course, like that of the Wadi Elei, lies further north-west ; their united streams flow into the Nile. Just south of Abu Hamed, the Wadi El-Sheikh flows in from the north-east.

The chief wadis draining into the Red Sea north of lat.  $20^{\circ}$  N. are the Hasium, the Di-ib (or Odib) and their affluents ; others, e. g. Khor Delaweb and Khor Shinab, will be mentioned in the coast description below. The Wadi Hasium flows in a north-east direction to the sea from the Abu Hodeid Hills. The Di-ib rises probably as far south as lat.  $20^{\circ}$  N., and flows generally northward. About 20 miles before it turns eastward to traverse the maritime plain, it opens out into a wide basin, 1 mile broad and 8 to 10 miles long, containing rich alluvial soil, which is cultivated by the local tribes. An important tributary on its left bank is the Wadi Hufra, which, rising in the hills to the north-east of Jebel Onib, joins it at the northern end of the Elba range. It receives all the drainage from the hills of the southern Balgab country by the Wadi Is and Wadi Legia. Good crops of dura are obtained at places in its bed. The Khor Onib is another tributary of the Di-ib on its left

bank, flowing into it at about lat.  $21^{\circ} 15' N.$ ; there are also tributaries on the right bank, e. g. the Yemum and Hipkok.

Between lat.  $20^{\circ} N.$  and lat.  $19^{\circ} N.$  three other considerable khors, the Haieit, Dirab, and Mahaleit, unite and drain into the Red Sea. The Haieit rises in the Bawati range, its bed is cultivated in places, and contains wells. The Khor Arbat rises in the hilly country south of lat.  $19^{\circ} N.$ , opens out into the plain of the Khor Odrus, which the Berber-Suakin caravan route crosses, and enters the Akareirirba Hills (5,459 ft.), after which it becomes narrow and is enclosed in a steep defile. It flows for some distance parallel with the Nile-Red Sea watershed, then in a north-east direction towards the coast at Mersa Darur. Two or three miles before reaching the coast it is reported to be joined by the Khor Garar. It has a number of tributaries throughout its course.

Inland the most important wadi of the southern Atbai is the Amur; it rises among the mountains behind Port Sudan, and flows in a general western direction to the Nile, into which it empties itself rather south of lat.  $19^{\circ} N.$  It has several tributaries on either bank, e. g. the Tifaieb and Gheioh, joining it from the north-east. A great part of its course is still unsurveyed.

There are a number of wells, many brackish, of varying depths throughout the Atbai, among the hills and mountains, near Mohammed Gul, and at other places along the coast. Among the best-known are the Murrat wells, south of Jebel Rafit and east of No. 5 station. Rock basins, called *galts* or *makhzans*, are often found high up among the hills, usually formed by potholes in eruptive rock. The crystalline rocks of the Red Sea district have deeply carved valleys filled with gravel and detritus, forming a permeable deposit known as Valley Fill. Water absorbed by it from the streams rushing downhill after rain is protected from evaporation, and readily tapped by wells. These are usually sunk in the beds of surface streams, like the Khor Arbat, north-west of Port Sudan, often as the deepening of a water-hole when the water is decreasing. It has, however, been proved that the line of surface stream

does not necessarily coincide with the deepest part of the rock valley. Surface wells get filled up during the rains by the stony débris washed down, and have to be dug out afresh. In some of the desert districts, where no trace of water is visible, the natives are reported to be usually able to obtain it, though they refuse information as to its whereabouts.

### *Coast*

The general trend of the Red Sea coast from Bir Shalatein (north of lat.  $23^{\circ}$  N.) to Ras Kasar (lat.  $18^{\circ}$  N.), is south-south-east; the length, with its numerous shallow indentations, is over 400 miles. The entire stretch of shore is studded with reefs and islands, among which are some good anchorages, but very careful navigation is required. Protected by the reefs is an inshore and smooth water channel, useful for small vessels, which may be said to begin at Ras Raweiya (Rawaiya, lat.  $21^{\circ}$  N.), the most prominent headland on this stretch of coast, and to end with the south Massawa channel (lat.  $15^{\circ} 15'$  N.) in Eritrea. Its average width in the stretch north of Suakin is from  $1\frac{1}{2}$  to 3 miles, narrowing in places to  $\frac{1}{2}$  mile, but south of Suakin it becomes wider, passing outside the extensive shoals in a bight of the coast about 18 miles below Suakin. There are several entrances to this channel from seaward, among the best of which one is off Port Sudan, and another off Suakin.

The coral coast is mostly low and sandy, covered in places with bush or scrub; low sand-hills approach it, and peaks of the maritime range some 20 miles inland form, as has been already said, valuable landmarks. A succession of khors or inlets runs inland to a depth of a few miles, some of them affording anchorage. But there is usually no great depth of water, and the entrance is rendered difficult by reefs and shoals. The islands and islets are mostly only a few feet above water, and are formed of coral or sand; the most important are known as the Suakin group, lying off that port.

The following is a general description of the coast from north to south; only the more important islets and anchorages are mentioned. For details of the latter, see pp. 590–602.

At lat.  $22^{\circ} 51' N.$  is Mersa Shab, an extensive inlet almost blocked up by the coast reef and inaccessible to ships. South of this are several reefs; one called Shab Abu Fendera extends for 4 miles from east to west, and lies 17 miles off the shore. The three Siyal Islands (lat.  $22^{\circ} 48' N.$ , long.  $36^{\circ} 13' E.$ ) are between 7 and 9 miles from the shore, the whole space between them and it being blocked by intricate reefs. Twenty-eight miles to south-east is Elba Island (Gezira el-Dibia).

Mersa Haleib (lat.  $22^{\circ} 13' N.$ , long.  $36^{\circ} 40' E.$ ) is an excellent harbour, with two anchorages, north and south; there are good wells near the latter. Cape Elba, the terminating point of the Jebel Elba is 18 miles to south-east. Between here and Ras Raweiya, 65 miles to south, the coast recedes.

From Mersa Shinab, the coast trends south-east for about 23 miles to Sandy Cape, the north-eastern point at the head of the Raweiya Peninsula. Two reefs lie  $3\frac{1}{2}$  and  $5\frac{1}{4}$  miles respectively south-east of the entrance to the Khor, and are succeeded by Shab Kummere, 5 miles long; all three are within 3 miles of the shore.

Ras Raweiya is only 1 mile wide at its inshore end abreast of Shab Kummere, but, projecting seaward about 13 miles in a south-east direction, is about 4 miles wide at the actual Ras (127 ft. high); this has low sandy points, about  $2\frac{1}{2}$  miles distant from it on either side, terminating the promontory in those directions. Its southern extreme is encumbered by shoals, but there is a large stretch of open water in the deep bay on the western side not easy of access. The extensive inlet enclosed by Ras Raweiya and the reefs extending to south from it is known as Dongonab (Dokhana) Bay; its southern mouth is partly obstructed by small islands, reefs, and shoals. There is a well of good water about a mile from the beach of the inner bay.

About 9 miles south is Mohammed Gul (lat.  $20^{\circ} 54' N.$ , long.  $37^{\circ} 10' E.$ ). Jebel Erba is a useful landmark, and there are some lesser peaks between it and the coast. Mohammed Gul has both an outer and inner anchorage; large quantities of salt are exported yearly from the local



saltpans. To south is Makawa (Mekwar) Island, 310 ft. high,  $6\frac{1}{2}$  miles long from north to south, and about  $1\frac{1}{2}$  mile wide, it is about 4 miles from the coast.

About 7 and 16 miles south of Mohammed Gul are the anchorages of Khor Ankifail and Dabadib (Tibadeb) respectively; to south of the latter are the three sandy Teila Islands.

About 35 miles south of Ras Raweiya is the anchorage of Salak. From this point a series of reefs extends for 18 miles to south, the inner edge being about 3 to 4 miles, and the outer edge about 7 miles, from the shore. The most southerly of these, Shab Suadi, is 36 miles north of Port Sudan, and  $14\frac{1}{2}$  south of Salaka. At this point is situated the small, shallow harbour of Mersa Ar-Rakiya (lat.  $20^{\circ} 12' N.$ , long.  $37^{\circ} 10' E.$ ); near its north-west shore are two wells of slightly brackish water.

Between Shab Suadi and the reefs to south of it is an opening 5 miles wide, leading to the inner channel from Mersa Fijab to Port Sudan. Mersa Fijab is an inlet 2 miles long within a peninsula. One and a half mile south is the small harbour of Mersa Arus; Khor Gawateri enters the head of this bay, and at times discharges heavy flood-waters.

From Mersa Fijab to Port Sudan a series of reefs extends for 10 miles; they are 6 miles wide, and there is an inner channel about 2 miles wide between them and the fringing coast-reef. The coast in this stretch is very low, only about 2 or 3 ft. high, inland are small desert plateaux of from 10 to 20 ft., rising farther in by a gently sloping plain from 10 to 20 miles wide to the foot of the mountains. About 7 miles inland is a remarkable series of sandy, barren hillocks about 300 ft. above the plain. The lower hills of the mountains of the interior begin abruptly south-west of this chain, and from that point extend both southward and westward.

Eleven and a half miles south-west of Mersa Fijab, and also in the inner channel leading to Port Sudan, is Mersa Darur, a harbour forming the mouth of the Khor Arbat; there are

some brackish wells near the shore. North of Port Sudan are some reefs and shoals known as Mercier shoals and Wingate and Sanganeb reefs.

The general appearance of the coast continues the same, the mountain masses about 25 miles inland, behind the foothills, now rising to heights of from 4,000 to 7,000 ft.

Port Sudan (formerly known as Mersa Sheikh Barud or Barghut) is situated lat.  $19^{\circ} 36' N.$ , long.  $37^{\circ} 14' E.$  (For description of the harbour, see p. 590, and of the town, see p. 719.) Six and a half miles to south-east is the northern end of the dangerous Towartit reefs which run southward, parallel with the coast, to a point  $2\frac{1}{2}$  miles east-north-east of Suakin; between them and the fringing shore reef is the inner channel already mentioned.

Two khors, the Okwat and Handub, have their mouths in this stretch of coast.

Suakin harbour (lat.  $19^{\circ} 6' 58'' N.$ , long.  $27^{\circ} 20' E.$ ) is an inlet bordered by reefs on either side, the best approach being by the north-east passage. (For description of the harbour see p. 594, and of the town, see p. 721.) The currents in the southern approach are variable, strong, and perilous. A series of outlying reefs, shoals, and islets, known as the Suakin group, fronts the coast from Suakin to Nauarat, extending from the north Jumna reef in lat.  $19^{\circ} 27' N.$ , long.  $37^{\circ} 43' E.$  to Dahret Abid Island in lat.  $18^{\circ} 21' N.$ , long.  $38^{\circ} 46' E.$ —a distance of nearly 90 miles in a south-east direction. Some of the reefs lie as much as 15 miles outside of this line, i. e. nearly 40 miles from the mainland; they extend over an area about 25 miles wide, their inner boundary, where there are many sunken rocks and very deep channels, being generally about 10 miles from the shore. Among the northern islands of the group are Hind Kadam, Seil Ad-Dar (2 islands), and Barakut; among the southern, Akrab, Karb, and Tella-Tella (2 islands).

At 27 miles south of Suakin the mountain range approaches the coast and then trends inland to south-west, leaving a wide plain (the delta of the Baraka, where Tokar is situated).

Several khors, e. g. Gwob, Wintri, and Sitarab flow down from the mountains to the coast. Sandy Island lies just south of the mouth of the Gwob.

There are several anchorages south of Suakin. Between Mersa Sheikh Sad and Ras Makdah (see below) lies a large shoal called Shab ul-Shubuk, 17 miles long, and extending as much as 10 miles offshore. Nearly 13 miles south-east of Sheikh Sad is Sandhills point, with sandhills about 60 ft. in height.

Mersa Makdah (Makdum) is a capacious anchorage enclosed between the south-east part of Shab ul-Shubuk and Ras Makdah, which last is a low point marked by a sandy ridge. About 2 miles south-east is Ras Mukden, the northern entrance point of the inlet forming Trinkitat harbour (lat.  $18^{\circ} 40' N.$ , long.  $37^{\circ} 44' E.$ ). The harbour is open to the north-east, the coast is low and sandy; a sandy plain, flooded at times, extends some distance inland. On the south-east corner is an opening into a large shallow lagoon. There are reefs and rocky shoals outside. From here the coast trends south-east about 26 miles to Ras Asis (lat.  $18^{\circ} 26\frac{1}{2}' N.$ , long.  $38^{\circ} 7\frac{1}{2}' E.$ ), a low sandy point, between which and the next headland, Ras Shakal, 13 miles on, lies the Gulf of Akik, with wells of brackish water  $\frac{1}{2}$  mile inland.

Khor Nauarat (entrance, lat.  $18^{\circ} 15' N.$ , long.  $38^{\circ} 19' E.$ ) is 4 miles broad from its north-western point Ras Istahi to its south-eastern point Ras Farajin; the island of Bahdur occupies a large space in the centre of the bay. A chain of low sand or coral islands fronts the entrance. High land approaches within 5 miles of the shore on the mainland.

From Khor Nauarat the coast trends south-south-east about 20 miles to Ras Kasar, and is much broken up. There is a group of islands, including Farajin Island, El-Rih Island, Ras Abid, Sell Bahr. Fifteen miles south-east of Nauarat and  $5\frac{1}{2}$  miles north-west of Ras Kasar is Ras Abu Yabis, a low bushy cape with sandhills. To south of it, near the shore, are some conspicuous mountains; the coast fronting the hills is low. Ras Kasar (lat.  $18^{\circ} 2\frac{1}{2}' N.$ , long.  $37^{\circ} 36' E.$ ) is the northern.

most frontier post with Eritrea ; the coast reef here is in places nearly 2 miles off-shore.

For the continuation of these mountains south of Suakin, see below.

*District South of Suakin and Berber*

The maritime region, as above indicated, continues mountainous south of Suakin, to and beyond the Eritrean frontier. Among the mountains are stony plateaux, grassy or bush-covered plains, low bare hills, and many khors, mostly enclosed by steep narrow valleys. The Nile-Red Sea watershed runs north and south in about long.  $37^{\circ} 20'$  E. till the basin of the Khor Arab is reached. About 35 miles south of Suakin is the undulating plateau of Erkowit, some 3,000 ft. above sea-level, with low granitic hills rising from it to another 1,000 or 2,000 ft. This serves as the summer head-quarters for Suakin, which is rendered very unhealthy between June and September by the moist heat then prevalent. Some peaks of this mountain country (from north to south) are as follows : Jebel Shakaital (5,108 ft.) and Jebel Okwer (5,036 ft.) to north and south-west of Sinkat respectively ; Jebel Tenasei (4,060 ft.) and Jebel Adaribab (4,613 ft.), both east of the Baraka. On the southern frontier the mountains reach a height of 9,121 ft. in Jebel Hamoiat.

Jebel Shaba (3,848 ft.) and Jebel Haina are two prominent landmarks to south-west and south-east of Tokar, which is situated at the mouth of the Khor Baraka, 56 miles by road south of Suakin.

The wadis and khors rising among these mountains have in most cases not been completely surveyed ; their channels as they reach the plains become shifting and ill-defined. North of the Arab, three khors, the Kokreb, Habob, and Laimib drain to the west. The Khor Arab, which also drains west, has a very extensive basin, the whole triangle of country formed by the points Kokreb, Erkowit, and Oi. This includes the khors named Erheib, Thamiam (or Haia), and Barameyu, which flow down to south-west from the Erkowit region.

The Arab would seem to be formed by the junction of the Gemadieb on the west and the Hareitri on the east, at a spot north-west of Jebel Okwer ; its course is south trending to west, till it bends west near the station of Einha on the Atbara-Port Sudan Railway ; from this point towards Berber the railway approximately follows its course. It is broken up into many channels, and has a number of tributaries.

Among the more important of the khors draining to the east are the Adit and the Okwat. The Adit rises among the mountains south of Sinkat, and for a great part of its course runs northward, parallel with the watershed ; its maximum width is between Sinkat and Jebel Erba, it then narrows as it descends, turning west through the steep narrow defile, in places only 200 yds. wide, of the Khor Totali, to join the Okwat. The latter khor, rising in the Jebel Akareirirba, reaches the coast near Sallom.

South of the Arab and north of Jebel Tobrar the country is drained to the west by Khor Misrar and Khor Aderot.

The Atbara and Baraka Rivers are described below under ' River System ' (see pp. 62 ff.). The flood of the latter, between mid-July and the end of September, fertilizes the soil round Tokar, which is rich and well-adapted for cotton and cereal cultivation. The Khor Langeb is a tributary of the Baraka on its left bank, joining it, after a north-east course (unsurveyed) beyond Jebel Adaribab. It has running water in the autumn, and usually contains pools at other seasons.

There are a great number of wells in this district, of varying quality and depth. Some are mere water-holes, others are stone-lined, many are in the beds, or near the banks, of khors, like those already described in the Khor Arbat. Of this description are the Okok wells at Sinkat (within 7 miles of the watershed, at a depth of about 30 ft.), those at Gebeit, near Sinkat (at a depth of about 110 ft.), and those of the Khor Baraka. In the neighbouring maritime plain are many other wells, with fairly drinkable water ; this consists of the underflow from the Valley Fill above described, increased by local rainfall and occasional floodwater from the hills.

In addition to the well-known wells (e. g. Obak, Ariab) along the road, water is usually to be found between Suakin and Berber almost anywhere at a depth of about 15 ft., and in the dry watercourses at a depth of about 2 ft. It may be looked for wherever a ridge of rocks running north and south (i.e. parallel with the Nile) rises from the plain and intercepts the fall of the water. With improved irrigation this great open plain of the Odrus could be profitably cultivated.

Cotton is grown at Tokar. The black soil known as Sudanese 'cotton soil', so fine-grained as to be impervious, becomes deeply cracked in the dry seasons through the evaporation of the water that it has absorbed during the rains. As a surface deposit it varies in depth from the thinnest covering to 100 or more feet.

The desert country between Abu Hamed and Berber is cut up by numerous ravines; there are only scanty patches of cultivation, but these increase in the 20-mile stretch between Berber and the mouth of the Atbara, and again as Shendi is approached. Low stony or sandy hills rise from the sand or gravel plain, there is some grazing for camels, and some 'cotton soil'.

The district south of the junction of the Atbara and the Nile, bounded to east and west by those rivers and to south-west by the Blue Nile, has been called by geographers the 'Island of Meroe', though the name is unknown to the Arabs of the present day, by whom the district is divided into four, of which only the northern and part of the western regions lie north of lat. 16° N. The northern district, called El-Daheira (i. e. the high stony ground) forms the triangle El-Damer-Shendi-Adarama. It is a sandstone plateau, with poor sandy soil, broken by low hills, and bounded on the west by considerable ranges of sandstone hills. There is some cultivation in the wadis; the chief of these are the Mukaberab and El-Hawad, which have several tributaries. The western district, called El-Karaba, includes Shendi, Geili, Halfaya, and Abu Deleig (Deleik), the three last lying south of lat. 16° N. though north

of Khartoum. The soil is less sandy here, and the rainfall less insufficient, but cultivation is still confined as a rule to the wadis. Saltworks are frequently seen, and the water of the wells, which are fairly numerous, is usually rather salt, and only obtained at a great depth. Tanks (*hafirs*) for holding rainwater are a distinguishing feature of the district. All this region is little known and is largely unsurveyed. The two remaining districts belong to the intermediate zone, and will be described below.

To east of the Atbara, a more or less sandy plain, covered with coarse grass, extends to the hills of the Eritrean frontier. For some distance southward to Jebel Sanai (about lat.  $17^{\circ} 15' N.$ ) these hills are separated by wide valleys, from which many khors flow to south-west, but are in nearly every case hemmed in by sandhills, and so prevented from joining the Atbara. They thus form basins, which are cultivated. This sandy plain extends southward until the fertile soil of the Gash is reached.

#### INTERMEDIATE ZONE

The intermediate or transitional zone, between lat.  $16^{\circ} N.$  and lat.  $11^{\circ} N.$  may be divided as follows: (i) the country to west of the White Nile, (a) Darfur, (b) Kordofan, (c) Nuba Mountains, with a riverain strip; (ii) the central district bounded on the west by the White Nile, on the east by the Blue Nile, (a) the Gezira (lat.  $15^{\circ} 20'$  to lat.  $13^{\circ} N.$ ), (b) Dar Fung (lat.  $12^{\circ} N.$  to lat.  $11^{\circ} N.$ ); (iii) the country to east of the Blue Nile, consisting of the plain of the Atbara and the Rahad, bounded to the east by the Eritrean and Abyssinian frontier mountains, including the southern part of the 'Island of Meroe'.

#### *Country West of the White Nile*

*Darfur.*—Darfur, which was incorporated in the Sudan in 1916, consists of a steppe plateau varying from 2,000 to 4,000 ft. above sea-level, divided into two by a central watershed running from north to south, forming part of that

The map illustrates the Sudan region, showing its geographical features, rivers, and administrative boundaries. The Nile River system is a central feature, with the White Nile and Blue Nile converging at Khartoum. The Khartoum Desert and Nubian Desert are labeled, along with the Sudanese Steppe. Major cities and towns are marked, including Khartoum, Omdurman, El-Dueim, El-Obeid, El-Fasher, and J. Marra. The map also shows the borders of Egypt, Ethiopia, and the Sudan. The title 'SUDAN' is prominently displayed in the center. The map is dated 1907 and is part of the 'Sudan' series.

**25° E of Greenwich**  
**Naval Staff I.D.**

*Sudan Handbook. To face p. 28.*





which separates the Chad and Nile basins. Until the exploration of Commandant Tilho in 1917, much of the country was unknown ; the Jebel Marra massif, for instance, had not been supposed to be higher than 6,000 ft., whereas it really attains about 9,840 ft. The chief features of the watershed are, in the north, Jebel Meidob (3,178 ft. between lat.  $15^{\circ}$  N. and lat.  $15^{\circ} 30'$  N.), connected by a plateau with Jebel Tagabo (or Berti) farther south ; the high chain to east of the Kajja valley, whose chief summit, Durbulla, is over 7,200 ft. high ; farther south again, the above-mentioned Jebel Marra massif (about lat.  $13^{\circ}$  N.), connected with Jebel Tagabo. There are isolated peaks rising from the granite plateau of Dar Tama, in the north-west, which is itself about 3,000 ft. above sea-level. Stretching from the main mountain group for about 30 to 40 miles to the west is a ' huge dyke of white quartz with a sandstone plateau raised some 300 ft. above the plain '. To the south of Jebel Marra the plain is about 4,000 ft. above sea-level, and is dotted all over with granitic peaks ; these last also crop up to the north-east between Jebel Marra and El-Fasher. The col of Kowra, to the west of El-Fasher, is said by Tilho to be about 4,000 ft. high ; volcanic débris is seen here above the granite and schist. Here begins a salt region, which extends to Um Badr. Two large lakes, one salt, one fresh, at Deriba (alt. 4,804 ft.), an amphitheatre of hills between Jebel Nurniya to the north-east, and another conspicuous peak of Jebel Marra to the south-west, were visited by English travellers in 1918. Neither has any outlet above ground.

The geological formation is very varied ; in the north and south granite and sandstone are the prevailing rocks, in the east the soil is sandy and contains a quantity of iron, which is worked to a small extent. In all the depressions sand rich in iron is encountered. Jebel Meidob contains both sandstone and granite ; this group of peaks has been much distorted by volcanic agency, and beds of lava are to be seen in all directions. To the south-west is Bir el-Malha (2,887 ft.), an extinct crater, with a small lake impregnated with alkaline

matter, and springs of sweet water issuing from its sandstone and granite slopes. Jebel Tagabo is composed of sandstone ; the hills immediately to the south, round the Wadi Saya, are mainly granitic ; those a little farther south, round the Wadi Mileit (Melit) are of gneiss. There are a number of scattered peaks to the west of Jebel Tagabo, and towards the Wadai frontier, the Kordofan frontier, and farther south. Jebel Marra is of volcanic origin ; lava and granite are to be found everywhere, but no sandstone.

The general direction of the drainage is east and west. The country being largely unsurveyed, the course of the wadis, their junction with one another, and even their names, are in many cases uncertain. In the north, the country is so arid and the rainfall so meagre that the water draining eastward towards the Wadi Melh soon sinks into the sandy soil and disappears. In the north-west (Zaghawa) district, the Abu Haraz and the Shobak drain eastward ; the latter appears to be formed by the junction of the Koem (or Gerib) on the west and the Um Kia on the east, to south of Jebel Agaba. To the south-east of these is the Wadi Anka, flowing south-east to join the Wadi Beda (Beida), which flows almost due east (see below). To the east of the Anka and south-east of Jebel Agaba, the Wadi Foih and Wadi Malagab flow into a wadi which is eventually called Kobbe (Kobe) ; this flows first east, then north-east, then, near Jebel Fogarum, bends south-east, finally running almost due south to join the Wadi Magdub. The latter runs eastward towards El-Fasher, possibly joining the Ko.

From the Jebel Tagabo region the Wadi Beda flows south-east, receiving three tributaries (from north to south), the Madu (Muddo), Dugsi, and Saya, on its left bank ; it empties itself into the Wadi Itham near the Kordofan frontier.

The Wadi El-Ko also drains south-east. This is the most important wadi in the south district, rising in Jebel Tageran, to the north of El-Fasher, and draining towards the Bahr el-Arab, which, however, it seldom actually reaches. Several wadis drain into it from the mountains to west of El-Fasher,

and it has several tributaries flowing south-east from Jebel Marra ; the most important of these is the Amur, which joins it to south-west of Shakka.

Several wadis, e. g. the Bulbul, Gendi, and Ibra, trending south-east from the more southern slopes of the watershed, are believed to reach the Bahr el-Arab during the rains.

The general trend of the wadis west of the watershed is south-west ; the most important are the Kajja and the Azum. A wadi (? Abu Ardeib) in the Zaghawa district receives several tributaries from the east. It is known later as the Wadi Um Gedeti ; after receiving two tributaries from the west, it joins the Sunot, from the Dar Rug region to the east, at about lat.  $14^{\circ} 12' N.$ , and the two united form the Kajja. The Kajja flows at first in a general south-west direction, with several tributaries on either bank (e. g. the Erdebe and Bali from Dar Gimr to the west and the El-Seleia, south of lat.  $13^{\circ} 45' N.$  from the east), till at or near Bir el-Kebek, north of Drijel, it receives the Kota. This wadi's course is almost due south from Dar Jebel, with a slight trend to east, and the same description applies to the Shellal, which joins the Kajja some 10 miles farther west. The Kajja on this (the right) bank next receives an important tributary, the Azunga, flowing south-east from Dar Tama, and on the left bank two khors, the Wui and Kaburi. South of Bir Kajja, about lat.  $12^{\circ} 48' N.$ , it trends south-east in a series of curves, receiving on its left bank the Wadi Kudiunu which, with several of its tributaries, rises among the mountains of the Masalit district. The Kajja finally flows into the Azum near the village of Mogororo (approximately lat.  $12^{\circ} N.$ , long.  $22^{\circ} 15' E.$ ). Between its junction with the Sunot and its junction with the Azum, the Kajja has a course of approximately 85 miles.

The Azum, a fine khor, is formed by the union of the Birja, which rises in the Jebel Dima Talai, and has a general north-western course, and of several other wadis flowing south-west from the Jebel Marra. Continuing westward, the Azum receives several tributaries, notably the Karago and Aribo,

flowing from the Jebel Karago and Jebel Zurlai respectively to south-east, and the Wadi Barei (see below) from the north, just south of lat.  $12^{\circ} 45' N.$  Thence the Azum flows south bending to west before Mogororo is reached, and continuing westward to and beyond the Wadai frontier. Water is always to be found near the surface of the bed, a layer of coarse, white sand saving it from evaporating. It is believed to unite near Dar Sula, with other wadis draining the western slopes of Jebel Marra, and, under the name of Bahr el-Salamat, to drain towards the Shari basin, as do the wadis generally of south-western Darfur.

From the mountains near Kabkabia (Kebkebia) various wadis unite to form the Kolkol, which flows south-west past Kolkol to join the Wadi Barei. The Barei also runs south-west, receiving some streams flowing in from the north-west, and on the opposite bank the Burtu, south of lat.  $13^{\circ} N.$ , after which it joins the Azum. A network of streams stretches to the south-west from the Bir Tawil region, the most important of which is the Wadi Hamra, joined near the village of Umuru (lat.  $12^{\circ} 50' N.$ ) by a considerable tributary, the Batha (or Sogni).

The country north and east of the Marra range is sandy and scantily supplied with water; there is a little cultivation in the east. The wells are deep, and at great distances from each other. In north-western Darfur, Dar Gimr is described as flat and bare, waterless in the dry season and marshy in the rains. There is little cultivation here, but a good deal in the neighbouring district of Dar Tama. On the southern and northern slopes of the Tama plateau respectively, are the wooded valleys of tributaries of the Salamat and of streams descending from the Dar Hamid country, which is apparently an inland drainage basin (see below, under Kordofan). The Dar Masalit district, south of Dar Gimr, bounded to the west by the Wadi Azunga and Wadi Kajja, and to the east by the Wadi Barei, is undulating and sandy in the centre, and mountainous and well-watered in the south, where cattle and sheep are bred. Iron is found all over it, and is worked

locally. The districts west and south of Jebel Marra are much better watered and more fertile than those to north and east, and afford good grazing. In the rainy season much of southern Darfur becomes marshy, and the chief wadis turn into torrents. When the rains are over, their beds soon dry up, but water is generally to be found in abundance in the clayey strata a few feet below the surface. The depth at which water is found diminishes on approaching the Marra range. At El-Fasher there are several hundred shallow wells, sunk in the depression called Wadi Tendelti (Tanalti) in which the town lies; the Ko flows into it during the rains. Water is obtainable at 35 ft. even at the end of the dry season. On the other hand the wells at Karnak and Buta are very deep, 250 ft. and 150 ft. respectively, cut in the solid rock. At and near Taweisha the wells, which pass through strata of chalk and marl, average from 100 to 130 ft. in depth. The mountainous district, being the best watered, is the most populous and cultivated; cultivation takes the form of terrace-gardens all over the hill slopes. Tobacco is grown in the Tawila district.

Between Darfur on the west and the White Nile on the east are the Provinces of Kordofan and the Nuba Mountains. The region north of lat.  $12^{\circ}$  N. in the west and of lat.  $13^{\circ}$  N. in the east (i. e. of El-Odaiya-El-Birka-Kosti) is one of sandy steppes, south of this, one of hills and black cotton soil plains. Between these and the White Nile there stretches a fertile strip of black soil, often flooded by the river, and much broken up by khors, belonging administratively to the White and Upper Nile Provinces.

*Kordofan.*—The northern part of Kordofan, between lat.  $16^{\circ}$  N. and lat.  $14^{\circ} 30'$  N., resembles that of Darfur; it is a vast, arid, sandy tableland averaging about 1,300 ft. in height, and broken by low hills rising not more than 600 ft. above it. The sand is formed by the destruction of granite and sandstone hills through the action of heat and wind; it is reddish in colour owing to the presence of iron; the plains are covered with thorny scrub, and intersected by

numerous shallow wadis, usually dry in summer. These sometimes strike an outcrop of rock and form a small lake, which enables shallow wells to be dug, and an excellent water supply obtained. Salt is often deposited. At the wells of Safia, in the heart of the northern desert, a good water supply is always to be found; Girgil and Mazrub are two other watering-places.

The Wadi Melh (see above, p. 14) runs across the north-western corner of Kordofan to Um Badr; there are wells in or near it, e.g. at Bagaria, Um Soneita, Abu Zaima, Um Badr. It is the most westerly of a series of wadis, the name being locally applied to depressions, not streams, of which there are none. These are mostly unsurveyed, running generally from north to south, and affording rich grazing in the rainy season; they often have wells in their beds, e.g. (from west to east), the Um Soneita, Abu Laot, El-Mahbas; this last, at about lat.  $15^{\circ} 30' N.$ , runs into one called El-Merakh.

The more important hills are those inhabited by the Nubas in the north, Jebel el-Haraza, Jebel Katul, Jebel Kaja, and others. El-Haraza is a range of hills about 13–17 miles long. Between Um Badr and Foga a traveller has described seven summits, each about 1,000 ft. high, and having a striking resemblance to one another, which join the Kaja Serug range to the south-east of them. One of these is called Jebel Zeinad Atshan (i. e. thirsty), and is said to have a natural reservoir on its top. The Kaja Serug group contains 20–25 separate hills, stretching for 24 miles from north-north-east to south-south-west, averaging 10 miles in width. They include Jebel Muksam (3,080 ft.).

About lat.  $14^{\circ} 30' N.$  the real bush begins and the plain becomes more undulating. The soil continues sandy. There is no visible watershed; the rain sinks in where it falls, though in a few places it collects in ponds (*fulas*), which hold water for a few weeks after the rain ceases. This is the chief region of the gum forests (see 'Resources', p. 398). The shallow wadis give place to khors, the central district of Dar Hamid, between Shershar in the north and Ashaf in the south, being known as El-Khiran (plur. of Khor). The khors are divided by steep

ridges of red sand ; at the bottom of each basin the sand is greyish, containing much lime, and water is found at a depth of from 8 to 25 ft. There are shallow wells at e. g. Bara and Kagmar. Palm trees and cultivations flourish in this district.

Some heights in the El-Obeid district (e. g. Jebel Abu Sinun, Jebel Kordofan, and Jebel el-Ein) attain between 2,000 and 3,000 ft. Iron ore occurs to the north-east of El-Obeid, in irregular masses, at depths of from 6 to 10 ft. below the surface. It is also smelted at Nahud. The sandy soil round El-Obeid overlies at shallow depth a soft mica schist composed of very coarse fragments. There are good wells some 60–80 ft. deep in the depression in which the town lies. In some places it is necessary to cut through the bed of mica schist to obtain a sufficient water supply. Clayey soil becomes mixed with the sand increasingly towards the south or towards the Nile.

Well-sinking operations are being vigorously pursued by government in many parts of Kordofan. The water of some of the existing wells, e. g. one near Nahud and another near Jebel Shuweih, contains such a high proportion of nitrates as to be deleterious, if not actually poisonous.

Thirty miles to west of El-Obeid begins the sandy steppe region known as Dar Hamar, extending to the Darfur frontier. It is mostly covered with bush ; there are a few rocky hills in places. These are nearly all granitic, though there are a few of sandstone, such as Jebel Beraish near Foga and Jebel Wad Heidub near Nahud. There are practically no wells except at El-Odaiya and Nahud (those at Foga being reported in 1910 to have given out) ; the inhabitants depend largely on the water stored in the *tebeldi* trees (cf. p. 106). These fill the large valleys of the district, known locally as *shegs*, e. g. Sheg el-Hafisa, which sometimes hold water.

To south of this, extending approximately from lat. 12° N. to lat. 10° N. is the district known as Dar Homr. Its northern half, north of Muglad, is of reddish sand, interspersed with the gravelly soil known as *gerdud* ; its southern half consists of black soil, crossed by sandy belts covered with thick bush ; this bush changes into forest as the valley of the Bahr el-Homr



is approached. The northern part of Dar Homr is well watered by the Wadi El-Ghalla, which rises in Dar Hamar and flows in a south-west direction. On reaching the black cotton soil near Abu Zabad, the valley widens and the bed becomes full of grass and acacias (*sunt*); cultivation is carried on along the banks. It breaks into many channels, which separate and join again, and is fed by numerous small khors. It appears to be silting up at either end. At times the Ghalla holds much water, though there is never any stream; as soon as the surface water dries up, wells are opened in the bed. In the south is the Bahr el-Homr. The part of Dar Homr between the Ghalla and the Bahr el-Homr is said to be extremely short of water in the dry season.

Red sandstone, containing iron, similar to that found near Wau, is seen underlying the black soil here and there, as at Um Hagar and south of Jebel Likri. There is some arable land formed by ridges, 10 to 12 ft. high, of grey sandy soil, especially near Muglad and Baraka. Muglad has some pools which dry up about six weeks after the last storms; near Baraka there are some permanent wells.

The country between El-Obeid and the Nile is undulating. To east of Jebel Kon and Hashaba, and extending eastward to Zereiga and almost to El-Dueim, is a barren waterless district called El-Akaba, where little except *marikh* bush and coarse grass will grow. To north of it is an 'island' peak of crystalline rock, Jebel Shuweih, overtopping the intrusive masses, mainly granite, of the district, while farther north-east, about 10 miles inland from the Nile, near Shabasha, is a conspicuous peak of the same nature, Jebel Arashkol, with several summits.

In northern Kordofan the rainfall, as at Khartoum, seldom exceeds fifteen days in the year, between the middle of June and September; this is the rainy season in central Kordofan also. In southern Kordofan and the Nuba Mountains Province it begins in May and lasts till October. The rainfall in southern Kordofan is carried off by several considerable watercourses, which, however, are dry a few weeks after the last storms;

wells are often dug in their beds. Chief of these is the Khor Abu Habil, which rises in the hills west of Dilling, and flows north-east to Sungikai, where it turns east, finally losing itself in the sandhills near Gedid. During its eastern course it is joined by many affluents from the south, most of which rise in the Nuba Mountains. There are good wells along its course. The Abu Habil has been thought to connect with the three small lakes of Sherkeila, El-Birka, and Abu Serai; it seems, doubtful, however, whether this happens except in times of unusual fullness. When the lakes are dry, wells are dug in their beds. Another important wadi is the Shalango or Azrak, which flows southward from the Nyima Hills along the western edge of Dar Nuba, being fed by many streams rising in the hills. It flows in a narrow but deep channel through a level valley, and often carries much water, overflowing its banks in many places for a considerable distance. There are, however, comparatively few watering-places in its bed when dry. It finally loses itself in the swamps near Turda. Among the smaller wadis may be mentioned the Khor Kashgil, running from west to south-east across the southern part of the El-Obeid plain, and feeding Lake Rahad. When quite full, this lake measures 3-4 miles long by  $3\frac{1}{2}$  miles broad. It has been known to hold water for a great part of the year, and, when dry, wells dug in its bed give a good supply.

*Nuba Mountains.*—The Nuba Mountains begin south of El-Obeid and extend southward almost to lat.  $11^{\circ}$  N. In between them, and stretching eastward from them to the Nile, is cotton soil, swampy in the rains, and much fissured by cracks in the dry season. The mountains and hills form moderately high ranges of broad extent; they consist of rugged granite boulders, sometimes rising in large masses, as at Tagale and Miri, sometimes in small isolated hills. The main central mass of the Nuba Mountains is flanked on all sides by solitary peaks, of which Jebel Daier (4,800 ft), in the north-east over the Kordofan frontier, is the most conspicuous. The heights vary considerably; in the Tagale and Heiban-Obol groups they reach about 2,500 ft. above the plain, which itself

is from 1,800 to 2,000 ft. above sea-level. The character of the hills also varies, some of them, like the Nyima group, being a mass of rough rock, often honeycombed with caves ; others, like Gulfan, being covered with earth up to the top, with a few outcrops of rock. The slopes of these hills, the banks of their khors, and in many places the wide alluvial flats among them, are eminently suitable for cultivation. The best soil, a gravelly sort called *gerdud*, is found at their base. The country between them is cut up by innumerable watercourses in the black soil, and there are springs in nearly all the hills. The altitude of these mountains is steadily declining ; like those in Kordofan, they are worn-down stumps of an ancient high range.

The following is a description of some of the more important hills or groups of hills (from north to south).

Jebel Daier, to south-east of Baroki, has many bold peaks and crags ; its larger valleys are all on the southern side ; water is found in several places on it. Jebel Kadero (Kadaro) to south-west of Jebel Daier, consists of eight or more hills, shaped like a horseshoe, open to the south-east with a long spur extending to north-east. The range is from 6 to 9 miles long, and encloses a plain about  $1\frac{1}{2}$  mile broad, traversed by a khor. The mountains are chiefly granitic, with layers of quartz or of old eruptive rock ; they are broken by deep ravines, which in places broaden out into level valleys, where wells can be dug. About 50 miles to west of these are the four small detached hills composing Jebel Dilling (Delen), they rise only about 300 ft. from the plain, and form a short granitic range running in a north-west direction. Their sides are strewn with boulders and flat slabs. Wells are dug in the nearest khor ; the bed of this, as of others in the neighbourhood, is largely composed of old crystalline rocks, e. g. gneiss, mica slate, and hornblende. Farther west are the Nyima (Njuma) hills, a group of 8 or more hills, varying from 300 to 1,000 ft. in height, more or less isolated from each other, and forming a rough oval shape, with a long broken valley in the centre. They are difficult of access, especially Jebel Fassu,

which has a broken irregular formation and is honeycombed by caves. They have a fair water supply, and much land under cultivation. To the south of Dilling itself is Jebel Temain, by far the finest hill of the district. It has a plentiful water supply on a plateau about 500 ft. above the plain ; this is very difficult of access. A short day's journey to south-east of the Dilling range is Jebel Gulfan, a circular mass of 8 or more hills, about 7 miles in diameter and 800 ft. high. These hills differ in character from some already described, as their summits are more rounded, and they exhibit less granite and more mica slate, quartzite, and stones of the graphite age. The water supply is scanty, except for a pool on the Kurgul hill, which lasts throughout the year.

The north-east district of the Nuba Mountains, south-east of Jebel Daier, is occupied by Jebel Tagale (Tegele). Two ranges of hills run from Jebel Daduri to Jebel Rashad (about 2,950 ft., granitic, smooth, rounded top), and from Jebel el-Ahmar to Jebel Um Talha. The former is considerably higher and more rocky than the latter, and in places, e. g. to west of Keraia, is practically impassable ; round Keraia itself, however, the hills are not more than 450 ft. in height and comparatively easy of approach. Jebel Wadelki and Jebel Tukam are important hills in the eastern part of the district ; the latter is high and rocky, with numerous ravines and spurs. To south of them is Jebel Tagoi, a natural fortress. It is chiefly composed of gneiss ; the southern and eastern sides are precipitous and covered with huge boulders ; on the latter is found the hard, water-resisting stone known as *gabbro*. There are several broad valleys with khors between the mountains of this district.

Between Jebel Gulfan to west and the southern Tagale mountains to east is an isolated cluster of low, rocky hills known as Koalib ; Jebel Ambri is one of the largest. They are granitic, with veins of quartz, and enclose a small sandy elliptical plain. South of these and to north-east of Kadugli, a range of high hills covered with boulders is known as Heiban ; it includes Jebel Obol. The hills called Kadugli stretch north-

ward for about 9 miles from that post, many of them are rocky and precipitous. Their heights vary from 850 to 1,300 ft. above the plain. The Miri hills extend for some 20 miles to west of Kadugli, and vary in height from 500 to 800 ft. above the plain. To east of Kadugli is an extensive range known as Kawarma, the highest point of which is 750 ft. above the plain ; the range is divided into two by a valley some 6 or 7 miles long and  $\frac{1}{2}$  mile broad, through which a perennial stream flows. To south of this is a fine range, the Moro hills, running east and west for nearly 30 miles ; the peaks vary in height from 1,000 to 1,800 ft. above the plain, and the range is continuous except for a valley of some 2-3 miles wide, which separates the Lebu hills on the west from the others. Farther to the east are Tira el-Akhdar (about lat.  $11^{\circ}$  N.) and Tira Mandi. The former is a large irregular mass of hills, over 1,200 ft. above the plain, its main ridge running north and south for about 8 miles. Parallel with this, to east of it, runs a khor with a perennial stream. Tira Mandi is roughly rectangular in shape, 10 miles long from east to west and 5 miles wide. Its highest point is about 650 ft. above the plain. Many ancient gold-washing sites have been found among the surrounding hills, but it no longer pays to work them. To the south-east of Tira Mandi and north-east of Talodi is Jebel Gedir, an isolated hill some 650 ft. above the plain. Jebel Talodi, to south-west of that place is an island mountain, roughly circular in shape, rising about 4,000 ft. above sea-level (1,925 ft. above the plain). There are several wide deep valleys, and small plateaux on the summit with a fair water supply. The Krongo hills are a low range to the west of it, with a good water supply. About 40 miles to the south-east of Jebel Talodi is the high range of Eliri, which has abundant water from pools and shallow wells. The district south of Eliri, however, is said to be excessively arid, and uninhabited in consequence. The southernmost peak of all is the isolated Jebel Karondi (lat.  $10^{\circ}$  N.).

There are deposits of salt in Dar Nuba, and a plentiful supply of iron ; this last is smelted between Karondi and

Doleiba in the south. Laterite is found in small patches among the gneiss, much of it containing a good percentage of pure iron.

Among the khors of the Nuba Mountains may be mentioned the following: the Um Derafi, rising to the south of the Koalib range and joining the Khor el-Affin, which rises near Jebel Keiga Luban and flows southward past Kadugli; an unnamed wadi rising to the south of Lake Keilak and flowing sinuously to the south-west; the Khor Tandik (Tendik), later called the Kiteir, rising near Jebel Tandik and draining south-east to about lat.  $11^{\circ}$  N.

Following the spur of the Nuba Mountains which extends eastward towards the White Nile, the hills are seen steadily to decrease in height, the valleys to broaden out and the rocks to become more and more of later crystalline formation, e.g. mica-slate, amphibolite, quartzite, marble, graphite. The depressions between the hills turn into swamps during the rainy season. There are a number of khors, e.g. one in the Ahamda district, running in a south-east direction, with many wells in its bed. Farther south the Khor Nueila is said to afford good, deep watering-places.

Along the Nile itself, the numerous channels parallel with it, and the swampy and fissured character of the black soil already described, make landing and travelling very difficult.

*Central District bounded on the West by the White Nile, on the East by the Blue Nile*

This district includes the tract known as the Gezira, i.e. the Island, and the Dar Fung region to south of it; some parts, especially round Wad Medani, are very fertile. The country is for the most part flat, open and scantily supplied with water; in the south, mountains and forests are found, and the rainfall is considerably heavier.

*The Gezira.*—Though rather sandy in the neighbourhood of Khartoum, the soil of this flat alluvial plain, bounded on either side by the two Niles, gradually becomes richer and richer towards the south, until between Mesellemia and

Managil the acme of fertility is reached in the densely-populated district round Wad Medani. Here a considerable amount of clay, as much as 50 per cent. or even more, is found mixed with the light soil ; this, in damper climates, would render soil impervious and unfertile. But in the Sudan the intense baking which such heavy soil receives during the hot season renders it more permeable and productive. The typical cotton soil is also found. The town of Wad Medani lies on a high ridge of sand and gravel overlying a limestone formation. The eastern half of the Gezira is more fertile than the western, owing to the superior fertilizing properties of the Blue Nile.

The northern district is flat, and free from khors, so that the watershed between the two Niles can be ascertained by careful levelling only ; farther south, in the Gezira and in the district between it and Dar Fung (lat. 13° N. to lat. 12° N.) the watershed is formed by a low ridge of granitoid hills, with outlying spurs to east and west. Some of these hills (from north to south) are as follows, the figures represent heights in feet above the plain : Jebel Moya (about 500), Jebel Dali (740), Jebel Bozi (370), Jebel Abu Garud (about 1,500), Jebel Mazmum (580).

A brief mention must be made of Jebelein, on the eastern bank of the White Nile, at the boundary between the White Nile and Upper Nile Provinces. This is a conspicuous hilly formation with five granite peaks rising abruptly from the plain, the highest being about 600 ft. They form an amphitheatre of hills—two distinct masses with a third hill to the east of the northern mass.

Much of the country between Khartoum and Wad Medani is covered with grass, or low thorn scrub (acacia or mimosa) ; there is little bush. South of Wad Medani, there is some forest, chiefly acacias, but the country is open on the whole until the Dar Fung district is approached, when a dense forest begins, which apparently stretches from the White to the Blue Nile.

There are a great number of wells of varying depths ; they

average about 60 ft. on the eastern side of the watershed, near the Blue Nile, and 100 ft. in the central district; here they gradually become deeper as the traveller goes south, reaching 200 ft. a few miles south of Managil. To west of the watershed they are often not more than 15 ft. deep. In the north of the Gezira, many wells are salt, and in the western district they become so if used for long, so that new wells have constantly to be dug. Rain-water tanks (*hafirs*) are numerous, especially in the north. There is a plentiful supply of good water at Maatuk from wells 15–30 ft. deep. In the southern district, south of lat. 13° 30' N. approximately, there are wells at Jebel Soga and Jebel Dali, and natural tanks at Jebel Mazmum and Jebel Gerebin; these tanks and the Dali well are liable to run dry. Except for these, this plain is quite waterless in the driest season, and very sparsely inhabited, though the soil is extremely rich. Until south of Singa, no khors are to be seen; after this, along the river, the road is broken by many deep ones; there are also occasional large pools of water along the river.

The rainfall in the central and southern Gezira is noticeably heavier than in the north.

*Dar Fung*.—The eastern part of Dar Fung is more undulating than the western or than the Gezira. In the north, among other peaks, is the granitic Jebel Gule (1,050 ft.), farther south, Jebel Tabi. The forest above-mentioned extends between these mountains and southward to Jebel Surkum and Keili. The hills are scattered, and rise steeply from the surrounding country. Khors draining the Jebel Tabi and other hills cut up the ground, which is gravelly or stony. The most important of them is the Khor Deleib, which flows into the White Nile at Renk.

The northern part of the district suffers from lack of water, as that in the rocky khors very soon disappears, though it may often be found by digging in their beds. There are several waterholes at the foot of Jebel Gule, but the water is said to be impregnated with lime.



South of Gule, the rainfall is very heavy, the rainy season lasting from May to October inclusive. This district forms part of the great plain extending south to the Baro and Sobat.

*Country East of the Blue Nile*

The country to east of the Blue Nile, between Khartoum and Kassala and extending southwards beyond Gedaref, is a vast monotonous plain, traversed by the Rivers Atbara, Rahad and Dinder. The eastern limit is formed by the mountains of the Eritrean and Abyssinian frontiers ; on the Sudan side, these rise steeply from the plain, and are bare and rocky. Their substructure is a crystalline granitic rock which forms the rich, fertilizing soil carried down by the rivers. Their heights range from 2,000 to 4,000 ft., some of them (from north to south) are as follows : Jebel Eikitanob, Jebel Afodgumbib, Jebel Dobadob (all over 3,000 ft.) ; Jebel Adarabab (4,136 ft.), a precipitous granite hill ; Jebel Berinnis (4,000 ft.), Jebel Anderaib (2,344 ft.), Jebel Abu Gamal (3,054 ft.). Three miles to the east and south-east of Kassala town are Jebel Mokram (3,174 ft.) and Jebel Kassala (4,414 ft.) ; the latter is a conspicuous pile of red granite.

A number of khors run down from the eastern mountains, some flowing into the Gash, others apparently losing themselves in the plain. North of Kassala, for example, there are the Shallabob and the Kowateb, south of it, the Tagando, Malilla, and Abagalla.

The Atbara plain is flat and open, with sandy or gravelly soil, covered in places with bush, grass or thorn ; the river-banks themselves, like those of the Blue Nile and the Gash, have a thick belt of thorn or bush. The plain sloping towards the river, in the district south of Goz Regeb, is broken by many small khors, which begin with a gentle fall, but afterwards become precipitous, scooping out beds for themselves between steep banks. There is a broad strip of cotton soil bordering the river in this district, and tracts of it are found

scattered over the plain, e. g. between Khartoum and Kassala, and south of the latter ; it is much fissured during the dry season and has pools in it during the rains.

Though the soil of the plain would in many places permit of cultivation—increasingly so towards the south—this is mostly carried on in the wadis.

The district between Khartoum North and Abu Haraz (just south of lat.  $14^{\circ} 30' N.$ ) forms part of the so-called 'Island of Meroe', known as Shark el-Adeik ; the whole eastern region, from Adarama southwards, bounded on the west by the Wadi el-Hawad and by Geili, on the south-west by the Galaat Arang range, forms its remaining district, known as El-Butana. This is a famous grazing country, especially during the rains. When they have ceased, the grass soon dries up, and there are few wells. There are a great number of small wadis, with a short course, many draining northward ; they are known locally as *atmurs*. The most important is El-Hawad, rising to north of Jebel Geili, passing 12 miles east of Abu Deleig and opening into a wadi also called El-Hawad which trends towards the Nile at Kabushia and has numerous wells in it. The El-Hawad receives the Khor Jugjugi near Abu Deleig, the latter has numerous wells in its bed there and at Debbaghat. Other wadis, however, run in a south-western direction, e. g. the Abu Sueid (later known as the Hasib), and the Mrah.

Jebel Geili is a flat-topped granitic hill rising 250 ft. from the plain, with wells round its base. There are a number of low ridges and scattered peaks throughout El-Butana, also hillocks of friable soil, covered with thorn. The hills at Goz Regeb are strewn with cromlech-like granite blocks. Among the more important wells are Um Hatab (30 miles east of Kabushia, already referred to under Wadi el-Hawad), Um Shidida (30 miles east of the last), Um Rueished (50 miles south-east of Abu Deleig), El-Geleita (12 miles north of the last), Shag (12 miles east of El-Geleita), Rera (wells, and rock tanks in the Jebel Rera), El-Sadda (22 miles south-east of the last). Jebel Abu Gamal, 18 miles south of Kassala, has perennial springs. Galaat Arang is a granitic mass,

divided towards the middle by a gorge nearly a mile long, in which there are a great number of wells.

Kassala and the district of the Upper Blue Nile are fertile and well-watered. North of Kassala the Gash spreads out in fan-shape into small channels, many of these are lost in the ground even during the rains. Like the Atbara, it brings down a quantity of rich soil from the forest-clad hills in which it rises. The plain as above described continues south of Kassala, with the Sabderat range to east. The grass and *kittr* or other bush covering it become especially dense near the southern and western extremities. It is traversed by the Gash and by the streams which unite to form the Atbara, i. e. the Setit and the southern branch known as Atbara (Goang), with its affluent the Bahr el-Salam. The Abyssinian hills gradually approach nearer the plain, which becomes more undulating and broken by khors.

Gedaref is surrounded by extremely fertile black soil ; both this town and Mafaza, to south-west of it, are promising centres for cultivation and population. The rains last from June to October, and during them the plain is covered with long grass. Gedaref lies in an open valley, surrounded by bare hills of basaltic rock. The town has rock wells, with good but rather scanty water. There are wells at Wad Kabu (Akabu) to north-east of it, but water is very scarce between Abu Haraz (on the Blue Nile) and Gedaref.

For about 15 miles south of Gedaref the country is undulating and bare, with rocky ridges and valleys of rich soil. To south of this is a forest region, waterless, and largely unexplored, with many low, detached hills.

The following are some of the khors in the district between Kassala and Gedaref ; the Bahogi and the Khasa, both rising in the Jebel Rera and flowing north-west into the Atbara ; the Gergaf, formed by the junction of the Marahik and the Emeiloba near the intersection of lat.  $14^{\circ} 45' N.$  with long.  $36^{\circ} 15' E.$  ; the Abu Faragha, flowing west and then south-west from Gedaref ; the Hisheib, rising in Jebel Hisheib, and flowing north-west. It has good wells near its source. To

south-west and south-east of Jebel Hisheib respectively are Jebel Serug (2,095 ft.), a black-capped cone, and Jebel el-Araht (2,160 ft.), with two conspicuous white pinnacles.

There are a number of khors, some of them unsurveyed, between the Blue Nile and the Dinder and Rahad. The Khor el-Agaliin, called also Um Degul and Mehara, rises near Abu Saad (about lat.  $12^{\circ} 37' N.$ ) and flows in curves, first north then north-west, to join the Dinder. The Khor el-Atshan rises near the village of Kagayik and trends in a wide curve to join the Dinder at Wad el-Hassan (lat.  $13^{\circ} 15' N.$ ). The Semsem (Simsim) is formed by the drainage of the hills near Doka and runs south-west to join the Rahad (about lat.  $13^{\circ} 5' N.$ ).

There is some densely-wooded country between the Dinder and the Blue Nile, and some covered with thin bush.

The central and south-eastern parts of the Gallabat district are hilly. There are perennial streams of running water near the town, though the Khor Abnaheir, on which it stands, becomes stagnant and foul towards the end of the dry season. Apart from the town, the water supply is mainly from wells supplemented by the heavy rainfall. The soil is fertile.

South of Gallabat, the country becomes essentially hilly, merging into the Abyssinian Mountains. The Khor Galegu, rising in Jebel Tomat in Abyssinia, flows north-west to join the Dinder at the village of Galegu, shortly before reaching which it forms a number of pools. There are marshy pools also at Ras Amer, a little to the north. The Galegu district is thickly wooded near the khors, and covered elsewhere with stunted trees or open grass.

The alluvial plain of the Dinder and Blue Nile in which Roseires is situated is very fertile, as is the Beni Shangul district lying between Keili on the west and Jebel Faronge on the east; it is drained by the Tomat, which empties itself into the Blue Nile. The Offat does the same after a northward course from the Jebel Keili in which it rises; it has water-holes in it. Water is also obtained from pools in the khors among the mountains of the Fazogli and Keili districts,

e. g. Jebel Keili (1,250 ft.), Jebel Fazogli (1,005 ft.), but none of them hold it perennially. Some alluvial gold is also found in them ; the Khor el-Dahab, from Jebel Faronge, being the richest in this respect.

#### TROPICAL ZONE

The limits of the tropical zone of the Sudan have been variously defined. Here it will be treated as the district lying approximately south of lat.  $11^{\circ}$  N. In this imaginary line, however, the Nuba Mountains, which have on the whole the characters of the intermediate zone, make a salient about 30 miles deep between long.  $29^{\circ}$  and long.  $31^{\circ}$  E.

This tropical region is characterized by long and heavy rains increasing towards the south and south-east, luxuriant vegetation of the forest and savannah type, and a negro population. It is in shape a wide shallow basin, the containing walls of which are the plateau of the Nile-Congo water-parting on the west and south-west, the mountains of the Uganda frontier on the south, the Abyssinian highlands on the east.

The bottom of this basin, which drains from every direction into the Nile and its affluents, is the great Nilotic swamp region lying approximately between lat.  $7^{\circ}$  and lat.  $9^{\circ}$  N. and acting as the regulator of the Upper Nile and Bahr el-Ghazal systems. This swamp zone, which is nowhere more than 1,300 ft. above sea-level, is believed by some authorities to be the remains of a vast lake, of which a vestigial relic survives in Lake No. It is continued east of the Nile by the marshy savannahs of the Sobat-Pibor district. North of a line following the Bahr el-Arab, Bahr el-Ghazal to Lake No, White Nile to Atar, and the Sobat River, the swamp belt, owing to a slight elevation of level and reduction of water supply, shades into the boggy black clay plains of South Kordofan, Nuba Mountains, and Sennar. This wide band of flat bush country, which is subject to marked seasonal changes between the conditions of marsh and steppe, stretches from the western frontiers of the Sudan to the Abyssinian foothills

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*Naval Staff I.D. 25° E of Greenwich*

*Sudan Handbook. To face p. 48*



and forms the transition between the tropical and intermediate zones.

The whole western and southern edge of the swamp depression is bordered by the gently rising ground of the ironstone plateau, which sweeps in a wide curve from Dar Fertit in the west to the Dodinga country on the Uganda boundary (about lat.  $4^{\circ}$  N., long.  $34^{\circ}$  E.). This ironstone rim is the north-eastern fringe of the great ferruginous (laterite) tableland of Central Africa. The line dividing its red earths from the black mud of the swamps is fairly clearly defined, running approximately north-west to south-east through Chak Chak, Wau, Tonj, Rumbek, Gondokoro, and the Lokoya and Lafit hills, though isolated pockets of ferruginous earths occur farther north. East of the Lafit range the country is unsurveyed. This laterite country, which everywhere overlies older granite and gneiss formations, marks in the west and south-west the line of the Nile-Congo water parting. Its slope here is gentle and its form that of an undulating wooded tableland with an average altitude of 2,000–3,000 ft., broken here and there by hills and knolls of granite and ironstone rock and traversed by the innumerable streams which have obtained for this region the name of the Land of Rivers. Near the Nile, the granite hills become more thickly clustered and are the predominant feature of the surface relief. East of the Nile, on the Sudan-Uganda border, they form important mountain ranges, 7,000 to 8,000 or more ft. in height, divided by valleys of rich ferruginous earth.

It will be obvious from this short description that the country is best studied in three parts: (1) the black clay plains, (2) the swamps, (3) the ironstone plateau.

### *The Plains*

The plains of the southern Kordofan, Nuba Mountains, and Upper Nile Provinces, extending without substantial change of character westwards from the White Nile into Darfur, are bounded to the south by the courses of the Bahr el-Arab, Bahr el-Ghazal, and White Nile. Formed by the gradual



erosion of a crystalline range of which the relics survive in the Nuba Mountains and Jebel Marra, they have an average altitude of 1,400 to 2,000 ft. above sea-level. The greater part of the surface is covered with stiff, close-grained black clay (cotton soil), but this is broken on the west by belts of sand running south-west to north-east, and in the east by the sporadic emergence of ironstone pockets and granite hills and rocks. The most important of these crystalline outcrops is a scattered line of granite hills and boulders, forming a southerly outpost of the Nuba Mountains, and running south-west to north-east from lat.  $10^{\circ}$  N., long.  $30^{\circ} 35'$  E. to lat.  $10^{\circ} 30'$  N., long.  $31^{\circ} 35'$  E. This rises in Jebel Kuara or Talassa to 3,100 ft. above sea-level, and 1,700 ft. above the surrounding plain. South and south-west of the massif formed by Kuara and the subsidiary peaks of Eliri and Tekeim, ironstone appears on the surface. This tract contains many wells and rain pools, and is traversed by the Khor Lolle and Khor Ragaba, which unite opposite the wooding station of Berboi to run through the swamps parallel to the White Nile.

For the most part, the plains are covered by thick bush and jungle, chiefly acacia in the north, but in the south approximating in type to the forests of the Bahr el-Ghazal, and containing many large trees. This forest, much of which is still unexplored, ends abruptly at a distance of about 15 or 20 miles from the river, where the land becomes water-logged and forms a bare, treeless belt (*fawa*), separated from the Nile by a permanent swamp averaging 500 yards wide, but north of Lake No nearly 2 miles in breadth. Owing to the peculiarly spongy and retentive nature of the cotton soil, the whole country becomes boggy during the rainy season—approximately May to November. Large tracts are then flooded, depressions such as those of Abiad (35 miles south-west of Talodi) and Keilak (25 miles south-west of Kadugli) are transformed into considerable lakes surrounded by marsh, and the low-lying districts near the rivers in the south-west become impassable swamps. Keilak, which is

fed by 3 khors draining the western Nuba Mountains, is 6 miles long and 2 broad when full, and only dries completely in exceptional years. The surrounding marsh is covered with luxuriant grass much valued as pasture. Abiad, receiving the drainage of the central Nuba massif, only fills in very wet years. It then forms a lake about 5 miles long and 2 broad, and retains its water until the following rains. South of it, low-lying open country, which is a morass during the rains, extends to the swamps bordering the Bahr el-Homr.

The seasonal changes in this region are strongly marked. The swiftness with which the soil becomes saturated is only equalled by its promptitude in drying up when the rains are over and the north-east trades begin. By January, the surface is a hard black mud, seamed by deep cracks, owing to the rapid shrinkage caused by evaporation. The watercourses too are dry; though water may be had at most seasons by digging in their beds. These water courses, which are not numerous, mostly flow from north to south in narrow, steep-sided channels, and lose themselves in the swamps. The only river of importance is the Bahr el-Homr (see Rivers).

To south and south-east, from Jebel Ahmed Agha to Lake No, the Kordofan plain is separated from the White Nile by the fertile and densely populated grasslands of the Shilluk country (Upper Nile Province). This is a strip of alluvial soil about 20 miles broad, rich near the river but poorer inland, traversed by numerous khors and subject to inundation in the autumn floods. The banks of the river itself are swampy to an average depth of 1,500 yds., and are separated from the savannah by a continuous narrow belt of thick trees, or riverain forest.

East of the Nile, the Sennar plain, extending from the White Nile to the Abyssinian foothills and bounded to the south by the Sobat, shares many of the characteristics of south Kordofan; but the heavier and more prolonged rainfall (April–November) caused by the proximity of the Abyssinian high plateau normally converts the whole district south of lat. 9° 40' N. into a vast swamp during at least

six months of the year (June–December). On the eastern frontier the hills, which are clothed with forest, rise in Jebel Fanagamendu to 4,640 ft., in Jebel Kasnangaru to 4,220 ft. and in Jebel Keili to 3,800 ft. The valleys are well-watered and fertile, but apt to be swampy in the rains. South of lat.  $11^{\circ}$  N. and west of long.  $33^{\circ} 50'$  E., where the foothills of the eastern highlands begin, the surface is an absolutely flat expanse of rich black clay-marl of the cotton soil type, only broken in the north-east by the scattered granite hills of the Keili district, extending west to Jebel Gerawi (long.  $33^{\circ} 25'$  E.). The most important are Jebel Mig Mig, Jebel Abul Dugu, and Jebel Ulu. In these, and in the fertile valleys of Keili, water is found at most times of the year in the natural rock-reservoirs, and beds of the khors, and crops are successfully raised. North of  $10^{\circ} 30'$  N., the plain is covered by dense forest; and south of this line by savannah, which becomes more and more marshy in the south and finally approximates to the conditions of the swamp zone. The east side is watered by numerous khors descending from the Abyssinian frontier, and flowing south-west and west in deep channels bordered by thorn bush. In most of them water lies in pools or may be found by digging at all seasons. None of these khors appear to make the complete journey to the Nile, but end in patches of marsh in the central plain. In the rains, the water percolates westwards and drains into the khors entering the Nile at various points between Kodok and Jebel Ahmed Agha. The most important of the eastern watercourses is the Yabus, a considerable river rising in the Amam country (Abyssinia) and entering the Sudan about lat.  $9^{\circ} 55'$  N., south of Jebel Gogot. In its Sudan course (partly unsurveyed) it is about 70 miles long, and has an average width of 50 yds. It is unfordable after June 1. The Sonka (or Daga) also rising in Abyssinia and entering the Sudan at lat.  $9^{\circ} 15'$  N., runs west for about 50 miles. Both discharge into the great swamp extending north and south from lat.  $9^{\circ} 30'$  N. to the Baro and east and west from long.  $32^{\circ} 45'$  to long.  $33^{\circ} 30'$  E. By it they are connected with the Adar, which collects through numerous

a region of slush. East of long.  $34^{\circ}$  E. the level is broken by the outlying spurs of the Abyssinian high plateau rising toward the frontier to an average altitude of 4,000 ft., and in the Boma group (lat.  $6^{\circ} 5' N.$ , long.  $34^{\circ} 50' E.$ ) attaining over 6,000 ft. The whole region is still imperfectly known.

### *The Ironstone Plateau*

The wide zone of ferruginous earths which borders the western, south-western, and southern Sudan, covers in the Bahr el-Ghazal province alone a larger area than the swamps. On its north-eastern edge, where it joins them, it has west of the Nile the character of an almost level flood-plain, covered with a thin bed of rich alluvial earth, and mostly clothed with savannah. From this flood-plain, undulating country of the park-land type rises gently, with frequent outcrops and scattered boulders of ironstone on the lower ground, to the broad wooded plateau which forms the Nile-Congo watershed, at an average altitude of 3,000–4,000 ft.

This is the region once known as the 'Zeriba Country' where the Arab dealers in slaves and ivory had trading stations which often reached the dimensions of considerable towns. It is well-drained and comparatively healthy. The surface is composed of a red, sandy soil, highly fertile, which overlies a pitted ferruginous laterite. Much of it is covered with thick bush, passing on the higher ground into extensive sub-tropical forests. The slopes are everywhere gradual. Only a very slight elevation marks the water-parting, which is often difficult to determine, and there is nothing in the nature of a ridge. In the south, the principal elevation is Jebel Baginse, on the 29th meridian (2,953 ft.) where the frontier crosses. From this point to Mopwi the country is covered by low forest. Between Dar Fertit and French Equatorial Africa, the watershed runs through an uninhabited region, for the most part covered with dense forest, and largely unexplored. West and south-west of Chak Chak the general surface relief becomes more pronounced, the country here lying in large folds of savannah and forest about 1,800

to 2,000 ft. above the sea. There are numerous outcrops of granite, which everywhere underlies the laterite; many of the domes and ranges which emerge on the higher part of the plateau rising 400 ft. or more above the table-land. The most important of these ranges is the compact granite chain stretching north and south from Jebel Migi, south of Kafia Kingi in Dar Fertit, which is the source of several tributaries of the Adda, or eastern branch of the Bahr el-Arab. Equally striking are the fantastic Mangaia hills, about 25 miles south of Raga (lat.  $8^{\circ} 5' N.$ , long.  $25^{\circ} 45' E.$ ) a series of huge blocks scattered over an area 12 miles from east to west and 8 miles from north to south. The largest, Chighigone, rises 689 ft. above the plain, and is nearly 1,100 yds. in length. Similar granite outcrops on a large scale occur on the frontier south of Tembura, between the sources of the Bekki and the Yobo, where the escarpment forming the water-parting is easily recognizable.

The whole of this country is furrowed by the great network of streams which form its most characteristic feature; converging from west and south to feed the six great affluents of the Bahr el-Ghazal—the Bahr el-Arab, Lol, Jur, Tonj, Meridi, and Rohl. These in their upper courses are fine rivers, flowing in deep trough-like dales or ravines, the steep sides of which are clothed with gallery-forest and the bottoms filled with sand or alluvial swamp. They are torrential during the rains, when there is an average rise of 15 to 20 ft. The country between these dales is mostly of the park-land type. On reaching more level country, the ravines give place to wide flat valleys covered with sandy ferruginous silt, and bordered at a distance by low rocky ironstone hills and open forest. Through these the rivers meander between alluvial banks; gradually, with ever-narrowing bed and decreasing depth and current, emerging into an alluvial flood-plain clothed with savannah and subject to wide-spread inundations after the rains (October–December). Here the rocky hills and forests first retreat and then vanish, the river banks become flatter, the channel more uncertain,

until it is merged in the swamp through which these streams drain into the Bahr el-Ghazal system. As they are all reduced to a series of pools in the dry months when none of their affluents flow, the country at this time, except in their immediate vicinity, is practically waterless.

South of lat.  $5^{\circ}$  N., and east of long.  $30^{\circ} 30'$  E., the gentle contours of the ironstone plateau are masked by rugged chains of granite mountains, the westerly outliers of the continuous range which marks the Sudan-Uganda frontier and through which the Nile has forced its way. The most westerly of these groups forms a compact and densely wooded massif at the sources of the Yei or Lau River, between lat.  $3^{\circ} 40'$  and  $4^{\circ}$  N. and long.  $30^{\circ} 30'$  and  $31'$  E. Its principal heights are Korobei, 5,330 ft., and Hotogo, 3,752 ft. Rich sub-tropical forest descends its lower slopes, along the upper courses of the Yei and its main tributaries. The principal ridge, known as the Kuku Mountains, runs north and south parallel with the Bahr el-Jebel between Jebel Elengua (4,040 ft.) opposite Nimule, and the Kurruk hills opposite Gondokoro. As far as the Gougi Rapids, it forms a great jagged wall bounding the Nile valley to the west, and rising steeply to 3,600 ft. in height. Sheer precipices often descend several hundred feet from the summits, and the lower slopes are bare and steep. High broken land intersected by stony ravines lies between the mountains and the river, the bed of which is much interrupted by granite and basalt rocks and reefs. West of these mountains the country for nearly 100 miles is unexplored, but it appears to be a plateau some 3,000–4,000 ft. above sea-level and crowned by higher summits. It is said to be fertile and suited to cereal crops.

Between the Gougi Rapids and Rejaf, the mountains retreat from the river; the intervening country, which is still rocky and broken, being traversed by numerous khors. About 20 miles west of the Bahr el-Jebel the wide valley of the Luri, which flows north-east to enter the river opposite Gondokoro, separates the riverain range from the Niambara Mountains which lie approximately along the 31st meridian from lat.

4° 15' to lat. 4° 55' N., and rise in Jebel Gumbiri to 5,740 ft. The principal arm of the Tafari or Tapari River rises on their north-eastern slopes, and flows north to enter the Bahr el-Jebel about 15 miles below Bor. In its lower course it is known as the Gel, and in September is said to be a rushing stream about 15 yds. wide and 3 or 4 ft. deep, but dries in December. In its upper course, where it issues from the hills (lat. 4° 50' N.) it was described by Peney in 1861 as being 80 yds. wide and about a foot deep (January), but the greater part of its bed is unexplored.

To north and north-west of the mountain region, flat savannah with marshy depressions extends to the edge of the swamps. The soil in the whole of this district is shallow, and the underlying granite comes frequently to the surface in the form of long straight dykes.

East of the Bahr el-Jebel, the country consists of a plateau, which has between Nimule and Gondokoro an average altitude of 2,000 ft., and slopes gently northwards to the marshy savannahs of the Sobat-Pibor district. This plain is covered with bush and forest, and scored by ravines full of granite and basalt boulders, through which the Assua, Yappa, Kit, and other tributaries of the right bank flow. It is stony near the river, from which it is separated by the Kurdu Hills (c. 2,400 ft.), running parallel with the bank at a distance of 5 or 6 miles. To east and south this wooded tableland rises gradually through undulating park-land and savannah to the rugged mass of gneiss and granite mountains lying on the Uganda border, and forming the northern spurs of the great Central African high plateau.

These mountains consist of a series of nearly parallel chains or massifs, running north-west to south-east, and separated by wide valleys of ferruginous sand and clay and cotton soil, which open out to the north and merge in the wooded plain. The most important is the Imatong range, extending from about lat. 3° 40' to lat. 4° 20' N., and long. 32° 30' to long. 33° E. It consists of a central massif, rising in Jebel Langia to 10,120 ft., and two parallel spurs, running north-west and

separated by the wide valley of the Gyanetti. The whole is cut up into precipitous ridges separated by deep ravines, which are mostly filled with dense subtropical forest. The Gyanetti, a fast deep stream about 20 ft. wide, falls in cascades from mountain to valley. The Kit River or Gomorro rises on the north-western slopes of the Imatong and flows west; and the Ateipi, or north arm of the Assua, has its source near Jebel Aggu (5,970 ft.) on the Uganda border. The northerly outliers of the Imatong are continuous with a scattered chain of wild granite hills (Lungari, Lokoya, Belinian, &c.), which stretch north-west to the neighbourhood of Gondokoro. To the east they end in a tremendous escarpment of cliffs called the Lutuk Hills, over which in one place an affluent of the Kos falls sheer for over 1,000 ft. The Latuka valley, 50 miles long and 10 miles wide, running north-west to south-east, separates the Imatong from the Lafit (c. 6,000 ft.) and Loggire ranges (Jebel Egadung, 8,490 ft.). The valley bottom, which is broken by low hills, consists of ferruginous clay, sand, and yellow loam. It is traversed by the River Kos, flowing north between steep banks, which are said by some authorities to resemble the kunkur, or calcareous laterite, found in India. The upper bed is dry in spring, but is said to have water at a slight depth in all seasons. Issuing from the mountains the Kos empties itself into the great Badigeru swamp, one of the principal feeders of the Pibor system. To the east the Loggire Mountains are separated from the Dodinga range by the wide valley of the Kideppo, an uninhabited plain of cotton soil, covered with bush, and a celebrated haunt of game.

The Kideppo, one of the sources of the Lotilla, is a dry sandy bed during most of the year, but a considerable river 30 ft. deep in flood, flowing between 10 ft. banks. After entering its marsh tract, it is joined by the Zangaiyetta, draining the north face of the Dodinga. This, too, is an imposing river in its upper course, flowing between deep banks 120 yds. apart, edged with trees; but on reaching its flood-



plain it spreads and loses itself in swamp, through which its waters join the Kideppo. Numerous minor streams descend from the Dodinga. South of lat.  $5^{\circ}$  N. they flow in deep and well-defined beds, but north of this parallel disperse their waters in the marshy grasslands of Mongalla Province.

The configuration of the Dodinga massif, the source of these many watercourses, contrasts strongly with the rugged Imatong. It consists of a series of level ridges departing from a central plateau, 7,000 ft. in altitude, with many patches of dense subtropical forest. It is thickly inhabited. To the north it slopes to well-watered savannah, affording pasture in the dry season. To the east the country is much broken, with many deep khors. At about long.  $34^{\circ}$  E. the Kauwi Mountains form northern outliers of the Zulia group. East of them is an uninhabited grass plain, which becomes an arid wilderness in the dry season. Thence an almost unknown country extends to the north-western shore of Lake Rudolf and the south-western spurs of the Abyssinian highlands, which average 3,500 to 4,000 ft. in height. It appears to consist chiefly of a sandy plain, the depressions of which become swampy after the rains but are waterless in spring. The surface is broken by scattered groups of mountains; the most important being the Lorusia range (5,800 ft.) on the north-west shore of Lake Rudolf in the extreme south-east corner of the Sudan. A narrow belt of arable land separates its lower slopes from the lake.

### RIVERS

The rivers of the Sudan may be described under the following heads :

- (1) The Nile proper, from Nimule to Faras Island, including the Bahr el-Zeraf channel.
- (2) The Nile tributaries, viz. (i) the Atbara, (ii) the Blue Nile System, (iii) the Sobat system, (iv) the Bahr el-Ghazal system, (v) the Assua.
- (3) Independent rivers : the Gash and the Baraka.

## THE NILE

The total length of the Nile from Ripon Falls (Lake Victoria) to the Mediterranean is 3,526 miles, or, according to one authority, 3,473 miles. Of this some 2,160 miles, from Nimule on the Uganda border to Faras Island, 20 miles north of Wadi Halfa, lie in the Sudan.

The following are the distances between some important points: Nimule to Rejaf, 100 miles; Rejaf to Lake No, 486 miles; Lake No to Khartoum, 603 miles; Khartoum to Berber, 224 miles; Berber to Merowe, 277 miles; Merowe to Wadi Halfa, 448 miles. (See also *Table of Distances by River from Khartoum*, p. 532).

The main river changes its name twice in the Sudan. From Nimule to Lake No (junction of the Bahr el-Ghazal) it is known as the Bahr el-Jebel (Mountain River). From Lake No to Khartoum (junction of the Blue Nile) it is known as the White Nile (Bahr el-Abiad) as distinct from the Blue Nile (Bahr el-Azrak). From Khartoum to the frontier and beyond this to the sea, it is known as the Nile simply. The name Nile is, however, often used of its entire length from Lake Victoria to the Mediterranean.

The Bahr el-Zeraf (Giraffe stream) is not a separate river, but an off-shoot which leaves the Bahr el-Jebel near Shambe, and rejoins the White Nile above the Sobat confluence near Tonga, providing an alternative navigable channel for a distance of 180 miles.

The only tributaries of much importance which enter the Nile in the Sudan are the Assua, on the right bank 13 miles below Nimule; the Bahr el-Ghazal (Gazelle River) on the left bank at Lake No; the three following, all on the right bank: the Sobat, between Lake No and Kodok, the Blue Nile, at Khartoum, the Atbara (non-perennial), about 20 miles south of Berber. From the Atbara confluence for the rest of its course to the sea the Nile receives no tributaries on either bank.

The volume of the Nile is maintained at a fairly constant level by the Bahr el-Ghazal and Bahr el-Jebel, which at

Lake No discharge an average of from 300 to 500 cubic metres per second. The Nile flood is caused by the discharge of the Sobat, Blue Nile, and Atbara, which in the rainy season bring down the flood-water from the Abyssinian plateaux, where the rainfall is so heavy as to more than counterbalance the relatively small catchment areas of these rivers compared with those of the Bahr el-Ghazal and Bahr el-Jebel.

*From Lake Albert to Lado*

The Nile issues from the north-west corner of Lake Albert at a height above sea-level of 2,300 ft. For the next 110 miles it flows in a deep, broad, navigable stream with scarcely any slope or current past Wadelai and Dufile to enter Sudan territory at Nimule (alt. 2,060 ft.). The river in this stretch is free from obstacles, with numerous papyrus islands. It is bright green in colour, owing to an abundance of minute algae. The breadth of the channel varies, the average being 700 yds. At the northern end of this navigable reach the Sudan Government has reserved a small enclave south of Nimule, which serves as a port for the transshipment of goods to and from Uganda. Between Nimule and Rejaf river traffic is at all seasons of the year impossible. Here the river completes its descent from the last escarpments of the south continental tableland through a series of deep gorges and rapids, falling 575 ft. (2,100–1,525) between Nimule and Lado. From Nimule to the Assua junction a range of stony hills called Arju runs parallel with the river on the right bank, as the Kuku Mountains do on the left. They are succeeded by the Jebel Kurdu. About 4 miles below Nimule are the magnificent rocky gorge and falls known as the Fola Rapids (lat. 3° 40' N.). Here the river narrows to a width of some 50 yds., and rushes along a rocky gorge 325 ft. in length, and nowhere more than 52 ft. wide, over and amid reefs 30 or 40 ft. high, like a gigantic mill-race or water-slide. The water tears through this channel in a glassy-green sheet. From the foot of the Fola cataract it pursues a troubled and broken course, marked by the Yerbora, Gugi, and Makedo Rapids, nearly as far as Rejaf.

Thirteen miles below Nimule the Assua River comes in on the right bank), and several torrential khors come in on the same bank in this stretch.

The last of the above-mentioned series of rapids occurs at Bedden, some 10 miles before reaching Rejaf. From the foot of the Bedden Rapids to Rejaf there are shifting sandbanks and sunken rocks, the channel being navigable only by boats drawing not more than 3 ft. 6 in. The current is about  $1\frac{1}{2}$  mile an hour.

About 3 miles before Rejaf the Kit comes in on the right bank from the south-east. Its course is largely unsurveyed; it rises in the Imatong Mountains.

The Nile at Rejaf is 7 ft. deep at low water and 15 ft. in flood, and from 550 to 650 yds. wide. From Rejaf to Lado (28 miles) its general characteristics remain much the same.

#### *From Lado to Lake No*

At Lado the river definitely enters the Sudanese plain and its nature changes completely. The typical swamp area begins here. As far as Lake No the river, for nearly 500 miles, meanders sluggishly along in numerous marshy channels, with a very gentle slope (182 ft. in 475 miles). Its waters are comparatively free from mud, but still covered with a bright green scum. Its course from time to time is much impeded by the sudd which now first makes its appearance. Its direction in general is north by west as far as the lake. The sudd area is an irregular triangle of swamp, of which the northern base extends 200 miles west from the mouth of the Bahr el-Zeraf, and the southern apex lies near Bor.

At about 5 and 26 miles respectively after leaving Bor the river skirts two large lagoons, the second of which is known as Lake Powendael, and at Shambe it winds round the eastern edge of a similar lagoon. The average breadth of the Bahr el-Jebel throughout this reach is from 55 to 65 yds.; for a considerable part of its course between Shambe and Hellet Nuer it is only half that width.

*Bahr el-Zeraf.*—Near Shambe, about 180 miles below Lado,

numerous spills leave the river, the water from these eventually forming the Bahr el-Zeraf. This at first follows a false channel of the Bahr el-Jebel, which runs eastward and rejoins the main channel after a course of some 18 miles. The Zeraf itself, after a very winding and somewhat uncertain course, rejoins the main stream about 29 miles above the Sobat confluence. It averages about 45 yds. in width, and has a depth of from 5 to 20 ft. of water. Its current is feeble. It receives many deep khors on either bank. At the present time the upper part of the Zeraf, for about the first 40 miles of its course, is hopelessly blocked by sudd. The canal which connects it with the Bahr el-Jebel then comes in on the left bank, and for the remainder of its course the Zeraf is now navigable, as has been already stated. To west of the Zeraf, between it and the Nile, there is a ridge of comparatively high land, surrounded by swamps.

The main stream of the Bahr el-Jebel has now been completely cleared of sudd in a navigable channel through its entire length, and looks like a canal winding in a continual succession of loops and curves through banks of papyrus for several hundred miles. The whole country enclosed between the two branches and for an unknown distance east of the Bahr el-Zeraf is intersected by a maze of channels, lakes, and backwaters which in the rainy season merge into one vast swamp, covered with masses of vegetation—*um sūf*, tiger grass, and papyrus, which grows luxuriantly to a height of 16 ft. The flat monotony of the landscape is broken only at times by an occasional stunted acacia or by a patch of brushwood on higher ground. In this stretch the banks are quite undefined and numerous shallow lagoons (sing. *maya*) border the channel, only divided from it by narrow belts of papyrus. In contrast to the Bahr el-Zeraf, which is strongly discoloured, the water of the main river is of a clear brown. At Hellet Nuer a considerable branch takes off from it on the west. The channel of the Bahr el-Jebel is about 80 yds. wide where it enters Lake No at its eastern end.

*Lake No and Confluence of Bahr el-Ghazal.*—At Lake No the

Bahr el-Ghazal (q. v.) joins the Bahr el-Jebel, bringing down the waters of a great number of other streams coming from the west and south-west. It overflows its banks in the rainy season, inundating the surrounding country. Lake No (lat.  $9^{\circ} 29' N.$ ) is formed in this way, and acts as a reservoir for the waters of the sluggish streams which drain the extensive plateau between the Congo and the Nile. Its size varies according to the season of the year; in summer it is about 60 square miles in area. From this junction of the two rivers the lake is called Moghren el-Buhur (meeting of the rivers). The shallow lake and its marshy surroundings form a great evaporating basin which induces so great a loss of water that the Bahr el-Ghazal has at no time any effect on the volume of the White Nile. So feeble is the discharge of the former river that any check to its flow, such as that of winds blowing contrary to the direction of its current or even the rush of the Sobat flood, 78 miles below the lake, may extend its waters far and wide. In the dry season and when the current of the Bahr el-Ghazal is unimpeded, a wilderness of reeds takes the place of the water surface, and what water is visible is much polluted by decaying vegetable matter. The combined waters of the Bahr el-Ghazal and Bahr el-Jebel, on issuing from Lake No (or, according to some authorities, at the Sobat confluence), take the name of the White Nile as far as Khartoum.

*From Lake No to the Sobat Confluence*

On issuing from the lake the character of the river changes. It becomes broad, open, and fairly straight. The marshes on either side of the channel are wide, and there are numerous sudd islands. The papyrus and reeds are high and thick, but high land, often covered with forest, is visible beyond the swamps on either side, which is never the case with the Bahr el-Jebel.

For a long distance below the junction with the Bahr el-Ghazal the aspect of the country is extremely monotonous. Grass plains of apparently endless expanse extend on both sides of the river separated from it by swamps of great width.

Just after Tonga the Lolle comes in on the left; it is here about 76 yds. wide.

From Lake No the White Nile pursues a due easterly course at right angles to the former course of the Bahr el-Jebel, as far as the confluence of the Sobat, which enters it from the south-east on the east bank 78 miles below Lake No. In all this reach the current is slow, the fall very slight, and sudd blocks may occur from time to time. During flood time the discharge of the Sobat is nearly equal to that of the main stream above its junction, and holds up the latter as in a reservoir till after its fall in October; its effect is felt as far above this as Lake No itself. In the spring the discharge of the Sobat is feeble and the river itself is then unnavigable. The mouth of the Sobat is 80-160 yds. wide and 26 ft. deep. Its whitish colour prevails over the dark colour of the main river, and probably gives its name to the latter, thus accounting for the view already mentioned that the White Nile is first so-called at the Sobat confluence.

*From the Sobat Confluence to Abu Zeid*

From the Sobat confluence the river turns at first in a north-east direction but, soon after passing Kodok, resumes its northerly course, pursuing this as far as Khartoum. This course lies through a great alluvial plain extending from Abyssinia in the east to Kordofan in the west. Until Kaka is reached there is little variety in the scenery. The channel averages from 325 to 550 yds., and is obstructed by numerous islands. The country on either side becomes higher and the swamps less extensive.

Between the Sobat confluence and Khartoum, a distance of 525 miles, the White Nile receives no perennial tributaries, but several large khors join it on the right bank between Kodok ( $9^{\circ} 55' N.$ ) and Renk, chief of which are Khor Atar (Adar) and Khor Rau. The river flows sluggishly along with a low velocity of not more than  $1\frac{1}{2}$  mile an hour in winter. The colour and limpidity of the water show very little change throughout the year, and the seasonal variations of level are

not more than from 2 to 6 ft. ; the depth varies from 15 ft. at low water to 21 ft. in flood. The river narrows in places to less than 300 yds., but in flood time it is often of immense width, in many reaches up to 2 or 3 miles, and in general appearance resembles a lake rather than a river. Its banks, particularly on the left, are very low, and the flood-water spreads over them for several miles. Their average height is not more than 8 to 10 ft. above low water level. The river is at its lowest by the beginning or middle of April. The rainfall in the south then causes a constant and gradual rise, and the flood attains its maximum at the beginning of September, when the velocity of the current is some  $2\frac{1}{2}$  to 3 miles an hour. Its colour in winter is olive green or yellowish brown, due to the influx of Sobat water. The mean width of the river in flood is 1,870 yds. On all this stretch of 603 miles from Lake No to Khartoum there are only two obstacles to navigation, viz. the rocks at Danko Selim and El-Zoleit (Azalet) (11 and 17 miles respectively below Jebelein), which are dangerous at low Nile, and the Abu Zeid ford about 30 miles below Jebelein. Here for some 4 miles the river spreads out into a broad and extremely shallow sheet of water, about 1,200 yds. in width at low Nile, and upon its bed are masses of hard shell-conglomerate. In March and April in years when the water is very low, the depth is in places not more than from 1 ft. 5 in. to 1 ft. 8 in. Both banks are covered with thick forest.

Abu Zeid marks the northern limit of the sudd, though small floating pieces are found about 65 miles farther north. Hippopotami are not seen in any considerable numbers farther north, and the papyrus disappears. From this point downstream, although there is flooding on either side of the channel, there are no swamps properly so called.

#### *From Abu Zeid to Khartoum*

From Abu Zeid to Khartoum the Nile has a course of about 215 miles. In the first 83 miles, until El-Dueim, there are a number of islands, of which Aba Island, about 27 miles long,



is the most important. Between El-Dueim and Khartoum there are practically no islands. At El-Dueim the channel widens to a mile or a little under ; in the stretch between here and Salahia (66 miles) it varies from 700 yds. to 2 miles or over. Fifteen miles north of El-Dueim the rugged granitic mass of Jebel Arashkol shows up about 10 miles inland from the eastern bank. The reedy banks and black cotton soil are now gradually replaced by sand-dunes, with thick thorn bushes in places, and cultivated strips along the foreshore. As the water falls, large mud flats appear in the centre of the river ; their soil is rich, and they are cultivated between February and May. From El-Dueim onward a typical feature is a series of channels running parallel with the river on the left bank, where most of the cultivation is carried on. For the last 15 miles before Khartoum is reached the country on either side is low and flat, except for the isolated hills of Jebel Auli and Jebel Gurun. There are no trees ; the banks shelve, and the water is very shallow. The channel varies in width from over 1 mile to 2 or 3 miles at Omdurman, at high Nile. The Blue Nile (q. v.) comes in opposite the south part of Omdurman. The maximum depth of the Nile at Khartoum is 18 ft., the maximum, 25 ft.

#### *From Khartoum to Faras Island*

Below Khartoum for some 35 miles the Nile, as it is henceforward called, flows quietly along, studded with many large islands, and with a cultivated strip of land of some extent on the right bank. On the left bank the desert approaches the river closely. From Khartoum the general direction is north-east and then north or slightly north-west to Abu Hamed where it abruptly bends south-west as far as Debba, and then north again, thus describing a great irregular S-shaped figure, enclosing the Bayuda desert in its southern fold and the Nubian desert in its northern, and here comprising (with the Red Sea coast lands) the whole region properly called Nubia. The Wadi Mogaddam at some remote epoch was probably the main Nile channel.

*The Cataracts.*—The Nile has not yet finished its work of erosion here. In remote geological times the hills, mostly sandstones and limestones, with syenite and other granites cropping out about Aswan and elsewhere, were connected at intervals by cross-ridges. These ridges have now entirely disappeared in Egypt, where the river has completed its natural evolution. But in Nubia, between Khârtoum and Aswan, the Nile is still entangled in many places in the remains of the cross-ridges. Thus are formed the so-called 'Six Cataracts' of which five interrupt the course of the river in the Sudan itself. These are in no sense cascades or waterfalls, but long series of reefs extending in some reaches for many miles, but allowing of a possible, if intricate, navigation, except at low water. Khartoum itself is some 1,250 ft. above sea-level, and it is on the Nubian Nile that a total fall of 800 of these 1,250 ft. occurs in a distance of some 1,160 out of the river's total length from Khartoum to the sea of 1,917 miles. The Nubian Nile is thus both more rapid and more rock-encumbered than is the Nile in Egypt. The strips of cultivation along the banks in Nubia have an average width of scarcely more than half a mile, and are not even continuous, as the rocky walls of the plateau escarpments and the fringing hills approach in some places right up to the river banks and leave no space for cultivation.

The 'cataracts' on the Sudan Nile in Nubia are the following: the sixth or Shabluka, the fifth or Shellal el-Homar, the fourth or Belal (or Gab el-Abd), the third or Hannek, the second or Shellal el-Amka. Estimates of their length vary widely according as the more or less broken water above and below the main gorges and rapids is included in the reckoning. The above are by no means the only rapids and obstructions in the course of the Nile between Khartoum and the northern boundary of the Sudan.

At Wad Ramla, 35 miles below Khartoum, begins the sixth or the Shabluka 'cataract'. The actual rapids of about 12 miles in length begin 20 miles lower down, but the bad water above and below the pass extends some 55 miles from

Wad Ramla to Wad Habashi. In the actual gorge the river runs between high granite hills with great velocity, and the section is both deep and narrow, being nowhere more, and in places less than 200 yds. in width. From the gorge to Wad Hamed the river is split into numerous channels, and winds between islands covered with vegetation. Rocks and reefs appear above the surface and many others lurk beneath. Except at high Nile, navigation here is impossible for steamers and dangerous for smaller craft.

Forty-two miles below Wad Habashi lies Shendi, and from this point to the mouth of the Atbara, 86 miles beyond, there is little variety in the river scenery. The average height of the banks is from 25 to 28 ft. above the water. The channel is broad and interspersed with many sandbanks and islands. The right bank is flat and covered with a thick growth of scrub and thorn bushes. The left bank is lower, and the strip of cultivable soil here is much narrower than that on the eastern shore. At certain points low ranges of hills, such as Jebel Egerdan and Jebel Umali, approach the stream on either side.

*The Atbara Confluence.*—The Atbara River (q.v.) at its junction with the Nile has a width of some 400 yds., and a depth in the flood season of about 25 ft. Its banks at the mouth are steep and high. Its velocity in flood is so great that it forces the water of the Nile across to the western bank, and the sandbank thus formed causes considerable difficulty in navigation. For the greater part of the year its channel is dry, a sheet of glaring sand.

From the Atbara confluence to Berber, 20 miles below, the Nile runs at the rate of from 2 to 3 miles an hour.

Thirty miles below Berber is the Fifth Cataract. This is a system of tortuous rapids running through irregular reefs. It is formed by a ridge of black rocks broken up into islands, the chief of which is called Draka. There are in fact two distinct cataracts, a northern with two difficult passages, as the banks are covered with brushwood and mimosa scrub which prevent the use of the tow-rope, and a southern, the Shellal el-Homar properly so called. These cataracts are

dangerous, and impracticable during low water. Twenty-four miles below the Fifth Cataract occur the El-Bagara Rapids, passable at high Nile, but not at low or even mean Nile. From here for the next 50 miles is a reach of open water, though broken water occurs 18 miles below El-Bagara and at the Abu Hashim Rapids, and 50 miles farther down at the Mograt Rapids, 2 miles above Abu Hamed.

At Abu Hamed, where the desert reaches the very margin of the river, the Nile makes its second great bend and runs thence some 180 miles in a south-westerly direction to Korti. Navigation throughout the reach is difficult. The river is full of small islands, and the prevailing winds being north-easterly boats travelling up stream have invariably to tow the whole way. At Shirri Islands, 62 miles from Abu Hamed, is the head of the Fourth Cataract, the most dangerous and complicated series of rapids on the whole length of the Nile; they extend some 67 miles to Belal and are for all ordinary purposes unnavigable. A few miles below the foot of the rapids is Merowe. Near Debba, 76 miles below Merowe, the river resumes its general northerly course. From the foot of the Fourth Cataract as far as Dongola, a distance of 176 miles, it runs through a plain, with low banks, and offers no obstacles to navigation save occasional sandbanks at low and half Nile. The Dar Shaigia district between the cataract and Ambigol (Ambugol) is richer and better cultivated than any other south of the Fayûm.

Nineteen miles north of Dongola is Argo Island, 19 miles long, of rich soil, thickly populated and highly cultivated. The eastern channel here is narrow and was formerly navigable only for three months in the year; it has now, however, been cleared; the western contains many fertile islands. From Dongola to Kerma (34 miles) the river has now been made navigable for steamers except possibly at very low Nile. Seventeen miles below Kerma occur the Shaban Rapids and the Third or Hannek Cataract, some four miles of broken water, containing 8 or 9 different rapids, of which the last is the worst. The total fall is 18 ft., but at high Nile the

rapids are not serious. Numerous fertile islands are in the channel. Below the Third Cataract the river winds through broken rocky country. Twenty-six miles farther a low ridge of black granite crosses the stream, here 1,200 yards wide, and forms the Kagbar (Kaibar) Rapids. Only at actual high Nile is the river navigable for any save small boats. Five miles before reaching Kosha, 113 miles from Halfa, occur the Amara Rapids, insignificant except at low Nile. Thence the Nile penetrates the sterile and desolate country, known as the Batn el-Hagar, 'Belly of Rocks'; the right bank is a mass of black rocks, the hills on the left are of yellow sand. The river itself is a long succession of rapids and full of rocks, with the exception of a comparatively clear stretch between the Amara Rapids and Sarkamatto, 14 miles below them. Near Sarkamatto navigation is particularly difficult, even for small boats at high Nile, and thereafter the Dal, Tanjur, Ambigol, Atiri and Semna Rapids follow one another in quick succession. The Nile here presents an intricate labyrinthine system of rocks and channels, where as many as 350 distinct isles and islets have been reckoned, apart from the innumerable rocks and reefs between which the stream rushes in many foaming torrents in the dry season. This system culminates in the Second Cataract, 13 miles above Wadi Halfa, which extends for some  $8\frac{1}{2}$  miles; at low Nile it is impassable for steamers and large boats, and is navigable only with difficulty at high Nile, when it is a mass of rushing water.

From the foot of the Second Cataract the river is navigable for the remaining  $26\frac{1}{2}$  miles of its course in the Sudan. At Faras Island it is 800 yds. broad, with a current of  $1\frac{1}{2}$  mile an hour at low, 3 miles an hour at high Nile. Its banks are 20 ft. high at the former time and 4 ft. at the latter.

#### NILE TRIBUTARIES

##### *The Atbara System*

The Atbara River is formed by the junction north of Tomat (approximately lat.  $14^{\circ} 10' N.$ , long.  $36^{\circ} E.$ ) of two

branches, both of which rise in the Abyssinian Mountains. Authorities differ as to which of these two branches is its true upper course, but it seems preferable (following Lyons) to adopt the Takazye (Setit). Its claim appears established by its length, its volume in flood, the extent of its basin, and its effect on the régime of the main stream, which more than counterbalance the fact that the smaller southern branch bears the name Atbara for some part of its course before the junction. The Takazye will accordingly be described first.

The Takazye, known later as the Setit, rises at a height of about 7,000 ft. in the Lasta Hills (approximately lat.  $12^{\circ} 7'$  N.), close to the eastern escarpment of Abyssinia. It flows in a deep ravine in a west or slightly north-west direction receiving numerous small tributaries. Its bed averages 300 yds. in width. It is a torrential river, beginning to rise in May, having its flood time in July and August, and becoming very shallow after October, though it appears never to be entirely without water. Four miles east of Umbrega, where the Setit enters Sudan territory, it is joined on its left bank by the Khor Royan. Their junction marks the boundary between the Sudan and Eritrea on the north and between the Sudan and Abyssinia on the south bank. The Royan, except for occasional pools, runs dry a few months after the rains cease. From Umbrega the Setit flows westward for some 50 miles to the point where it is joined by the southern branch.

There are conflicting statements also as to the three streams forming the southern branch, each of them being considered in turn the main stream, the other two, its tributaries. The two more important are the Goang and the Gandoa (Gandwaha). The Goang rises near Chelga, north of Lake Tsana, and flows first north then west to Gallabat; the Gandoa rises south-west of Chelga. According to one authority, the name of the third stream is Bulwena. These unite 5 miles to the south-east of Gallabat, the combined stream on entering Sudan territory having a width of 131 yds. and a flood-depth

of about 16 ft. It is known, as has been already said, by the name Atbara. The river bed consists of boulders and coarse shingle varied by rocky outcrops, the banks are of firm, loamy soil. The river curves from north-west to north-east; for about 100 miles it shows little change of character until, shortly before it is joined by the Bahr el-Salam, the occurrence of strata of coarse gritty limestone in its valley compels it to cut its way through a series of deep, narrow gorges.

The Bahr el-Salam, which has received as a tributary in the earlier part of its course the Angareb, is about equal in size and importance to this branch of the Atbara at their junction; it rises north of Lake Tsana and runs in a general north-west direction, with a small perennial flow of water. Its bed is very rocky and bends sharply in places where it cuts its way through high cliffs. It joins the Atbara on the right bank 28 miles south of Sofi.

From this last point to the Setit junction, 44 miles on, the width of the river varies from 164 to 218 yds.; its channel lies in the sandstone substratum.

After the junction of the southern branch with the Setit to north of Tomat, the Atbara flows northward, often in a deep valley, as at Kashm el-Girba (approximately lat.  $15^{\circ}$  N., long.  $36^{\circ}$  E.). Here the river breaks up into several channels amidst a group of rocky islands, thus forming a heavy rapid in flood. A few miles lower down, a little below the point where the channels reunite, is the important Fasher ford, where the Gedaref-Kassala road crosses the river. Below this, the width of the channel increases to 382-437 yds., with a flood-depth of about 22 ft. Between here and Goz Regeb, some 80 miles farther down, the character of the Atbara changes considerably, it becomes more a river of the plains, with a flat, sandy bed and wide, steep, clayey banks. The banks in this stretch, and until 15 miles beyond Goz Regeb, are much intersected by khors and ravines extending for several miles on either side of the bed. From a point 50 miles south of Adarama until the Nile is reached the banks are covered with *dom* palms and scrub; if these

were cleared, the fringe of rich soil on either bank would repay cultivation. Inland from this fringe the usual broken ground, cut up by ravines, continues, but the ravines have become shallow and the upper lands are practically desert. The river changes little in character in its north-west course through the vast alluvial plain, and receives no tributaries of any importance. It flows into the Nile 24 miles south of Berber, after a total course of about 786 miles. Its width here is about 450 yds., its flood-depth 25-30 ft.

The waters of the Atbara are heavily charged with *débris*, as would be expected from the number of ravines emptying into it, the friable character of the soil, and the dense forests of the areas drained by its upper waters. This *débris* gives the river a dark brown colour, whence it is known as the *Bahr el-Aswad* (Black River), and forms one of the chief constituents of the rich fertilizing mud carried by the Nile in flood time.

The Atbara begins to rise early in June; between that month and September, when the storms are terrific and every tributary khor turns into a raging torrent, the river becomes much swollen. Its flood resembles a tidal wave, which as a rule reaches the Nile in the last week in June. The Atbara is at its highest in August, when the normal discharge in its lower reaches is at least 2,500 cubic metres per second, rising to a maximum discharge of 4,000 cubic metres. During September, the rains cease, and the Atbara falls rapidly; by the end of October it becomes fordable in many places, and by the end of November it is practically dry. Its bed is then a sheet of glaring sand, with occasional pools, until June comes round again.

### *The Blue Nile System*

The River Abai, the true upper course of the Blue Nile, is the most important river of Abyssinia, draining practically the whole of the centre of the Abyssinian plateau. It rises in the Gojam highlands and flowing northward for about 70 miles enters Lake Tsana near its south-western corner.



The Abai issues from the lake at its southern extremity, at a height of nearly 6,000 ft., and flows at first in a south-easterly direction, in a series of channels and rapids. It is crossed by an old Portuguese bridge at Agam Deldi, some 18 miles from the lake, and is not again bridged until it passes under the great railway bridge connecting Khartoum North with Khartoum, just above its junction with the White Nile, 1,007 miles from Lake Tsana.

For the first 500 or more miles of its course the Abai flows through Abyssinian territory. It receives numerous tributaries of which the Didessa is by far the most important; the flood of this river rises early and falls late; it joins the Abai, after a northward course, south of lat.  $10^{\circ}$  N. and in about long.  $35^{\circ} 40'$  E. The Abai rushes down from the mountains in a ravine sometimes 1,000 ft. deep to the Sudan plain, which it enters east of Fazogli, at a height of some 1,640 ft. above sea-level; hence it flows in a general north-western direction for approximately 460 miles to Khartoum.

The name Bahr el-Azrak ('Blue River') by which it is known in the Sudan is derived from its winter colour, which is a clear, limpid blue. The colour becomes deep chocolate in flood time owing to the immense quantity of matter in suspension with which it is charged.

Just below Roseires, the river is 437 yds. wide at its low stage and 656 yds. in flood, diminishing to 270 yds. in certain narrow places. The average width of the channel throughout its course in the Sudan is 550 yds.; it appears never to exceed 800 yds. The banks at Roseires are usually 19 to 26 ft. above flood-level on the eroding side, the other being more shelving and often flooded at high Nile. They become lower farther north; for the last 150 miles before Khartoum they are only from 6 to 8 ft. above flood-level. The difference in level between flood and low water is 20 to 23 ft. Generally speaking, the banks are not flooded. The eroding bank has usually forest (acacia, mimosa, or thorn jungle) up to the edge, while on the opposite shore, where deposit is taking place, is first a sandbank, then above it a slope with grass

and shrubs. The broken ground cut up by ravines which fringes the river for about a mile on either side leads up to an immense, level plain, generally about 48 ft. above flood-level; the soil of this, until the sandy region round Khartoum is approached, is almost entirely the fertile, black cotton soil of the highly-cultivated Sennar and Gezira regions.

As the Blue Nile opens out into this alluvial plain it begins to form curves and meanders, as do its tributaries the Dinder and the Rahad still more markedly. The Dindar flows in on the right bank about  $14^{\circ} 5' N.$  at 164 miles from Khartoum, the Rahad, near Abu Haraz, at 122 miles from Khartoum. (For both these rivers, see below.)

From Wad Medani to Khartoum (127 miles), the river has a slope of 1 in 13,500; it becomes wider and less sharply curved, and flows in a well-defined valley. Finally it turns abruptly westward and meets the White Nile at right angles.

There are a number of small islands in the Blue Nile, few of them more than half a mile long.

Throughout its course, the river never loses surface water, though in the first quarter of the year it shrinks, in the Sudan, to a series of very shallow reaches connecting deep pools, and even small native boats during this season find difficulty in navigating the stretch between Khartoum and Sennar. The Blue Nile begins to feel the effect of the rains on the Abyssinian plateau and to rise about the end of May or beginning of June. The rise continues rapidly throughout July, attaining its maximum in August. During the latter month it enters impetuously into the White Nile, and its great rise, which compels an equal rise of the White Nile, holds back the gentle flow of the waters of that river, ponding them up and forming an immense reservoir which floods the White Nile valley for nearly 200 miles; these waters are set free again as the Blue Nile falls in September. The Blue Nile flood reaches Khartoum about June 20 and Halfa in mid-July. The maximum discharge at Khartoum is about September 5, and usually reaches 10,000 cubic metres per second; in an exceptional year it once attained 12,000.

At this season the volume of water and the fertilizing deposit contributed by the Blue Nile are far in excess of that supplied by any other source. The minimum discharge is 100–200 cubic metres per second early in May. The velocity of the stream is always great. Even in February it is not less than 3 miles an hour, and in full flood it is more than double.

From the middle of June to the middle of December there is a regular steamer-service between Khartoum and Roseires ; after this the river becomes unnavigable for steamers. During November and December, when the water is falling rapidly, numerous sandbanks appear and the rush of water through the narrow channels is very great. Navigation is always difficult near Shellal Abdin, 25 miles south of Sennar, where a reef of rocks extends almost across the river, and again for the 5 miles just below Roseires, where there are dangerous rocks. Otherwise as far as this place there is little rock. Immediately above Roseires is a stretch of 6 miles of unnavigable cataract, so that steamers never ascend beyond the town. Sailing boats can navigate the river, beyond this cataract, as far as Fazogli.

*The Dinder.*—The Dinder rises in the Abyssinian Mountains to the south-east of Dunkur. The first 50 miles of its course lies through very mountainous country, after which it enters the plain of the Sudan near Jebel Um Idla (lat. 12° N.) some 60 miles east-north-east of Roseires. It then flows about 200 miles to north-west and joins the Blue Nile on the right bank about 40 miles above Wad Medani. Its bed near Dunkur where it leaves the mountains is rocky and about 100 yds. wide. In June 1901 it was here 3 ft. deep with a rapid current. In its course through the Sudan its bed is sandy and free from rocks. It is less winding than the Rahad and rarely exceeds 200 yds. in width, becoming narrower in its lower reaches, and at its mouth being not more than 120 yds. wide. In flood it is probably navigable by sailing craft if not by steamers as far as the frontier. The latter have ascended as far as Deberki, 120 miles up stream. It rises about the end of May or beginning of June and its flood reaches the

Blue Nile about the last week of June, earlier than that of the Rahad. Its flood-discharge is greater than that of the latter. The Dinder ceases to flow towards the end of February; in the dry season, pools stand in its bed. Its banks are steep and generally about 15 ft. high, being as a rule above the level of the adjacent country which, when the river is full, becomes flooded and marshy. The forests along its banks are of better quality and less dense than those of the Rahad. Its tributaries are unimportant.

*The Rahad.*—The Rahad rises in Abyssinia in the mountainous country to the west of Lake Tsana. It takes at first a northerly direction, but after entering the Sudan a few miles east of Meshra Abid (420 miles from its mouth) it flows generally north-west in an extraordinarily winding bed and joins the Blue Nile on its right bank near Abu Haraz,  $4\frac{1}{2}$  miles below Wad Medani. Its width probably nowhere exceeds 100 yds. and is frequently less than 60 yds.; in places it is 30 yds. only. Its banks, like those of all the Abyssinian rivers in their course through the Sudan plain, are steep and high. Sometimes the Rahad's banks (of which the right is the higher) are 40 ft. above the river bed at low water. In a few places the left bank is liable to be flooded (see below). But the Rahad loses much of its water by spills (sing. *maya*), and is a finer river above than below Hawata (south of Mafaza). It is torrential in character and in flood has been navigated by small steamers as far as Meshra Abid.

Navigation, however, is difficult owing to the river's rapid current and innumerable sharp bends, to the hidden rocks in the bed, and the presence throughout almost the whole course of *sunt* and other trees not only overhanging it but growing in the bed, the banks being densely wooded. About 8 hours' steaming above Ein el-Lueiga (where the boundary with Kassala Province comes in), a ridge of rock runs into the river from the right bank, extending to within 20 yds. of the left bank (uncovered in August); here the current is very strong. Near Matu (to north-west of Mafaza) there is also a strong current, due to some small islands which

appear to be of recent formation. For the last 16 miles to Mafaza, the banks are lower, the trees cease, and the adjacent country is swampy. Between Mafaza and Hawata navigation is fairly easy; from the latter place to the junction of the Khor Simsim there are a few trees and islands in the first seven or eight miles. South of Mafaza, *sunt* trees again become dense to within a few miles south of Hawata, where the fringe of trees recedes a few yards from the banks, which are covered by dense scrub. In this reach there are miles of castor-oil plant and cotton on the water's edge. Villages are scarce and the population very small, owing to lack of water in the dry season.

The current of the Rahad in flood is, as has been said, very swift, 6 miles an hour at Abid (August 1904). Its flood-depth is 16 ft. The flood reaches the Blue Nile about the first week of July. High water lasts about 90 days from the middle of that month. By the end of November the water ceases to flow at its mouth and only isolated pools are left in its bed. In the lower reaches a fringe of shallow, ill-defined ravines on either side rises gradually to the usual plain, absolutely flat and extending for about 1,000 sq. miles, some 48 ft. above flood-level.

Both the Rahad and the Dinder are heavily laden with fertilizing detritus, a part of which they deposit in their beds where the current is reduced. The effect of this is well seen east of Sennar where the two rivers have so raised their beds that their flood-waters overflow the plains between them and drainage lines join the two valleys.

### *The Sobat System*

The Sobat or Bahr el-Asfar, i. e. Yellow Water, is the name given to the combined streams of the Baro flowing from the east and the Pibor flowing from the south. These two rivers, both of which receive several tributaries, join at approximately lat.  $8^{\circ} 27' N.$  and long.  $33^{\circ} 13' E.$ , 27 miles south-east of Nasser and 757 miles by water from Khartoum. The resultant river takes the name of Sobat. This then flows past

Nasser, generally in a north-east direction, receiving several small tributaries on the left bank. About 8 miles below Nasser the Khor Geni, a loop uniting the Sobat and Pibor, enters from the south. Such loops, often of considerable length, are characteristic of the Sobat system. The river winds through absolutely flat country. Between Nasser and Shwai village its banks are alternately firm and marshy, but below this point are generally dry and steep, highest on the right, and rarely submerged in flood. The average mean breadth of the channel (April) is 100 yds., and the depth 18 ft. There is a flood rise of 10 to 15 ft., and considerable inundation of the country on the left bank, much of which is uninhabited. A depression about 700 yds. wide runs parallel with each bank, and forms a swamp belt after the rains, often lasting well into the dry season. About 10 miles above its confluence with the Nile, the Sobat receives on its left bank the Khor Filus, about 30 or 40 yds. wide, which connects with the Khor Wangnyait, and forms the largest of the Sobat loops. This only flows during the rains. Finally, after a course of 232 miles from the Baro-Pibor junction, the river enters the White Nile 56 miles above Kodok. Its width at the mouth is from 80 to 160 yds.

A considerable volume of water, estimated at 900 cubic metres per second, is discharged into the Nile by the Sobat during the flood season. The water is heavily charged with matter in suspension which comes by the Baro and its tributaries from the Kaffa mountain plateau in Abyssinia, and by the Pibor and its tributaries from the open plains and marshes to the east of the Bahr el-Jebel. The current varies from 1 mile an hour at low water to  $2\frac{1}{2}$ –3 miles during the flood. The colour of the Sobat is variously described as creamy-white and reddish-yellow, according to its condition before or during the flood.

*The Baro.*—The Baro River is regarded by some authorities as the chief affluent of the Sobat, and by some as its upper course. It rises between 60 to 100 miles south-east of Gore in Abyssinia, and descends from the high plateau to Gambeila

(the Sudan trading station 'enclave'), 355 miles from the Sobat mouth and 880 from Khartoum, in a series of rapids through wooded, mountainous, and hilly country. At the foot of the escarpment, it issues through a deep gorge into the plains at Finkio, increasing in width to about 200 yds., and meanders across an immense dead-flat alluvial grassy plain, varied here and there by extensive forests reaching to the water's edge. Fifty-five miles below Finkio, the Baro, here about 100 yds. wide, receives upon its right bank the River Jokau (or Garre), which forms in its lower course the boundary between Abyssinia and the Sudan. Some accounts give this khor a second mouth 15 miles farther west. In flood the Jokau, which is only 5 yds. wide at its mouth, brings down a quantity of muddy white water from the Galla hills; in the dry season water stands in pools in its bed. From the mouth of the Jokau to the confluence of the Pibor, the course of the Baro marks the Sudan-Abyssinian frontier. Its banks are well defined and frequently wooded, and are lined in places by swampy depressions. From Balimeul, about 10 miles east of the Jokau junction, to a point about 18 miles east of the mouth of the Pibor, its channel divides, making an important loop 40 or 50 miles long, and about 100 to 120 yds. wide and 4 ft. deep. This is the Adura, long supposed to be an independent river. The country between the two arms is a vast swamp when the rivers are full, and quite impassable. In the dry season it is a barren and monotonous plain. About 8 miles east of the Pibor, the Khor Makeir joins the Baro on the right bank. It is deep near the mouth, where the sandy bed is 30 yds. wide. It may be the lower course of the unexplored Sonka River, or only a spill from the Baro.

The total combined length of the Baro and Sobat from source to mouth is upwards of 500 miles. Owing to the heavy rainfall on the western slopes of the Abyssinian mountains drained by the Baro and its tributaries, the Sobat begins to rise toward the end of April, and the river is navigable to Gambella usually by the end of May, though a sudden fall is always liable to occur until the middle of June. The flood

attains its maximum about November 13. The river continues navigable until the end of December, when it again falls, until its minimum is reached at the end of April. For eight months in the year steamboats drawing 3-3½ ft. of water can ascend to within 30 miles of the Bure scarp, and flat-bottomed boats even for a longer period. Navigation on the Baro is sometimes difficult owing to the sharp bends and occasional narrowness of the channel. In exceptional years, such as 1913 and 1914, navigation may be reduced to four months. During the season, June to September, a monthly steamer runs to Gambeila from Khartoum.

*The Pibor.*—The Pibor River derives part of its waters from the great marshes which stretch from the Bahr el-Jebel on the west to the Abyssinian mountains north of Lake Rudolf on the east, and are caused by the drainage northwards of the Lafit, Imatong, and Oboya mountains in the Latuka country on the Sudan-Uganda frontier to the south. Part comes to it from the Abyssinian mountains by the channels of its most important tributaries, the Akobo and its affluents and the Gila.

The Pibor itself may be regarded as the combination of three rivers, the Vevino, Lotilla, and Kangen, all issuing from the swampy tract between lat. 5° and 6° N.

The *Vevino*, the most westerly of the three, drains the great Badigeru swamp east of Mongalla. This swamp is fed by the River Kos and its affluents and other streams from the Latuka mountain country, the Lafit and Imatong Hills (see *Tropical Zone* above). The upper course of the Vevino, between Ainyangak and Pabinoi, is marshy, and in March is merely marked by a riband of luxuriant grass. It becomes river-like near its junction with the Lotilla, but is reduced to a series of pools by the middle of January, and appears to dry in early spring.

The *Lotilla* rises in a swamp receiving the waters of various khors from the south. Chief of these are the Khor Borghei, running north from the Lafit and Oboya Mountains, the Kideppo, draining the Tu valley, and the Zangaiyetta, rising in the Dodinga. The upper Lotilla is usually dry by January.



After escaping from the marshes, it joins the Vevino a mile or two north of Nialeir. Twenty-five miles farther to the north-east, just above Pibor Post, their combined stream is joined on the right by the Kangen.

The *Kangen*, the easternmost of the three rivers, has been explored for 70 miles above its junction with the Lotilla. In flood it may have a depth of 15–20 ft. of water, and has a surface flow in its lower reaches for a considerably longer period than the Lotilla, but by February it is a strip of grassy morass 15 to 30 ft. wide. It may perhaps be regarded as the best claimant to be called the upper Pibor. None of these three rivers, or of the numerous khors which enter and compose them farther to the south, are perennial, and in the dry season they are simply partly waterlogged grassy depressions in the great level. The whole country through which they flow is an undulating plain, a swamp in the rains, a thirsty land at other seasons.

From Pibor Post the river formed by the combination of the above three, and now called the Pibor, pursues a northerly course for 182 miles to its mouth, with innumerable bends and windings. Its banks are ill-defined, swampy, and fringed with sudd, in places 200–250 yds. apart. The waterway in the flood is from 20–70 yds. in width, with a depth which gradually increases from mere shoal water of 15 inches to 20 ft. average for the 130 miles above its junction with the Awei. But in the dry season the Pibor is dry except for occasional pools south of this junction (March 1912). North of it the water is continuous, and presently an appreciable current is given to it by the Akobo River, which enters it on the right bank at Akobo Post. Continuing its general northerly course beyond this Post it receives the River Gila on the right bank, and its current increases to 2 miles an hour. It enters the Sobat 30 miles above Nasser, 213 miles from the Sobat's entry into the Nile.

The banks of the lower Pibor are as a rule swampy, the adjoining country is flat and grass-covered, with but few trees. South of Koratong the banks are firm and dry and trees

become general, especially on the right bank. The waterway in the lower reaches is very narrow, until about 40 miles from its mouth it widens to from 40–100 yds. In February, March, and April navigation is hardly possible by steamer. During the rest of the year the average depth of water is at least 10 ft. Its discharge at the mouth was (October 1901), 13,500 gallons a second. Its width at the mouth is 80 yds., of which 30 are blocked by sudd, which is at all times a danger on the waterway. Its maximum depth here is nearly 30 ft.

The tributaries of the Pibor are as follows :

The *Awei* or *Agwei* (called *Gur* by the Nuer and *Kongkong* by the Beir) drains from the Boma plateau in the south-east and joins the Pibor 22 miles south of Akobo Post. It has been explored for 60 miles above the confluence, and seems to be of perennial flow, but is liable to be choked by sudd. It flows for the most part through an open grassy plain with occasional patches of bush. Its banks, which are well defined, are 3 ft. above the level of the river in flood, and 60–80 yds. apart. At this time it overflows its banks in places and floods the adjacent country to a considerable depth. The average width of the waterway is over 30 yds., its depth about 18 ft. in flood, reduced to 3 ft. in March, its current 2–2½ miles per hour when full, one mile an hour at low water.

The *Akobo* or *Juba* rises on the edge of the Kaffa plateau at 3,000 ft. above sea-level in Abyssinian territory. After a course of 55 miles it is joined on the left bank by the Kaia. The Sudan–Abyssinian frontier runs up the Akobo from its mouth to this junction, and then pursues the line of the Kaia to the watershed between the Nile basin and Lake Rudolf. The Kaia is otherwise unimportant except during the rains. Below its junction the Akobo widens to 60 yds. and then again contracts to 25–30 yds. For the first 100 miles or so of its course it flows through a more or less hilly country, but in its lower reaches it traverses a level country between well-defined banks, well wooded as far as Neum village, but open grass land, much liable to inundation in the rains, for the last 30 miles. It enters the Pibor at Akobo Post 66 miles from the

Pibor mouth. Its average width in the lower reaches is 20 yds., with a depth of 7 ft. and a current of 3 miles an hour (February). Above Neum village it shoals badly in places. Its discharge near the mouth was (October 1901), 2,185 gallons a second with a clear waterway here 15 yds. wide between belts of sudd on either side 20-30 yds. wide, and a depth of 14 ft.

The *Gila* (also spelt Gela, Gelo, Jilla) or *Bako* rises in the Moicha hills and flows west-north-west, roughly parallel with and to the north of the Akobo, to the Pibor, which it enters on the right bank, 26 miles above the junction of the Pibor and Baro. The whole of its course thus lies in Abyssinian territory. It is 30-40 yds. wide at its mouth with a swift current, and is the principal affluent of the Pibor in the dry season. An open treeless plain separates it from the Akobo. Its right bank is well wooded beyond the swamps which border the actual stream.

The *Mokwai* or *Bela* is a smaller affluent of the Pibor on the right bank, and joins it a few miles south of the Baro junction. It rises in the Gurafarda range of hills, and the whole of its course lies in Abyssinian territory. A very marshy strip of land separates it from the Baro River on the north, to which its course is for the most part parallel. In flood it is said to be a considerable river.

A great part of the Sobat plain to the south is still unexplored.

### *The Bahr el-Ghazal System*

The northern slopes of the Nile-Congo watershed, the uplands of Dar Fertit to the west, the southern mountains of Darfur to the north-west, all discharge abundance of water into the great basin of Bahr el-Ghazal Province by innumerable streams, which combine to form several rivers of considerable size. In the far south-east of the province one of these rivers, the Kaia, along the course of which runs the Sudan-Uganda frontier, enters the Bahr el-Jebel independently 20 miles south of Rejaf. To the west of this a group of rivers eventually

discharge their waters into a wilderness of sudd-choked morass<sup>o</sup>, and it is doubtful if any of this water ever reaches the Nile at all. But the remainder (and the majority) of the rivers of the province flow into the Bahr el-Jebel by the single mouth of the Bahr el-Ghazal River at Lake No.

In general, the rivers flowing from the Nile-Congo 'Divide' northwards are similar in character. Each in its career passes through three zones, the ferruginous steppe-plateau, the flood valley, and the swamp. In their upper course through the ironstone plateau they are mostly fine broad streams, flowing in deep dales or ravines with high banks and sandy bottoms, and fed by the countless water-courses which seam the upper slopes of the watershed, and become raging torrents during the rains. Reaching lower ground the rivers enter on their flood-valleys, through which they wind between well-marked alluvial banks; emerging, with reduced depth and volume, into the marshy plains which border the swamp zone. Here they break away from their banks, which soon disappear, and wander slowly northwards, choked with weed in many places. During their course they change their name from time to time. From the western and north-western uplands come two considerable rivers, both still largely unexplored, and combining various streams in their upper courses. These are the Bahr el-Homr from Dar Fertit and the Bahr el-Arab from Darfur, and they join the Bahr el-Ghazal independently before it reaches Lake No. These two rivers also deteriorate in their lower courses and are badly choked by sudd.

So great is the loss by evaporation in the marshes and from the rivers themselves due to the retardation of their flow by weed, that despite the vast quantity of rain-water poured down into its basin in the course of the year, causing an average rise of 15 to 20 ft. in the upper courses of these rivers, and great inundations in their valley tracts, the Bahr el-Ghazal contributes little or nothing to the Nile flood (see Irrigation). Its tributaries are of interest to the Bahr el-Ghazal Province itself, but scarcely to the rest of the Sudan or to Egypt. Herein they differ completely from the tributaries of the Nile

on its right bank, already described, on which the entire prosperity of Egypt depends.

The Bahr el-Ghazal rivers may conveniently be summarized and described under the following heads: (1) the Bahr el-Ghazal; (2) the Bahr el-Homr; (3) the Bahr el-Arab; (4) the Lol system; (5) the Jur system; (6) the eastern or swamp rivers from west to east: (i) the Ibba or Tonj; (ii) the Meridi or Gell; (iii) the Nam or Rohl, with its tributaries Ire and Yolo; (iv) the Yei, Lau, or Rodi.

*The Bahr el-Ghazal.*—The Bahr el-Ghazal is not so much a river as a channel draining the great swamp area west of the Bahr el-Jebel. In spite of the large volume of water received by these swamps from the rivers of the Nile-Congo watershed, so much is lost by evaporation and absorption that the discharge of the Bahr el-Ghazal at Lake No, where it joins the Bahr el-Jebel, is insignificant, and the part which it plays in the Nile system is slight. It has three great tributaries, all entering on the left bank; the Bahr el-Homr, Bahr el-Arab, and Jur. The distance up stream from Lake No to the swampy mouth of the Bahr el-Homr is about 60 miles, to the inflow of the Bahr el-Arab 97 miles, and to that of the Jur, 128 miles.

Meshra el-Rek, the old port of the Zeriba lands, where the channel of the Bahr el-Ghazal emerges from the surrounding swamp, is about 153 miles above Lake No. It is accessible to light craft at all times of the year, though with difficulty from the end of April to August. There is steamer communication in August and September. The river, here known as the Kit, flows due north between extensive swamps. Its bed between Meshra and Lake Ambadi has an average width of 190 yds., but most of this is covered with sudd. The actual channel is often only 20 to 35 yds. wide and 6 to 12 ft. deep, and would soon close entirely were it not periodically cleared. The sudd here is composed of low trailing and floating plants, making a tenacious slimy mass of water weeds entirely different in character from the solid reed sudd of the Bahr el-Jebel. About 25 miles below Meshra the Kit is joined by a branch from the west, bringing in the waters of the Jur. Fourteen miles farther

north it expands to form Lake Ambadi. This has at low water an average length of 10 miles and breadth of 1 mile, which in flood time is enormously increased. It is bordered, especially on the west, by vast swamps, and is the chief reservoir of the Bahr el-Ghazal system, and nursery of its sudd plants. In the deepest parts it has an average depth of 10 ft., but shoals rapidly towards the banks. Leaving Lake Ambadi about 50 miles north of Meshra, the river flows for 40 miles in a narrow, deep, and tortuous channel, averaging 12 yds. wide and 12 ft. deep, the principal area of sudd blocks. At the confluence of the Bahr el-Arab, the forest comes down to the river banks. It is known as the Ghaba B'ta el-Arab, and is one of the few wooding-stations on this river. Here the Bahr el-Ghazal turns north-east, and meanders slowly through flat grass plains and marshes. Ant hills dominate the landscape. A belt of papyrus fringes the banks, which are about 40 to 60 yds. apart. Forty miles below the confluence of the Bahr el-Arab, after traversing a lagoon a mile long and 400 yds. wide, the most dangerous part of the sudd area, the scene of Gessi's disaster, is reached. Beyond this, forest borders the river for 2 miles, after which nothing but grass plain and swamp are seen on either hand. The channel narrows, varying from 12 to 6 yds., but the water is deep (12 to 16 ft.) and fairly swift. From Meshra 126 miles, and 31 miles from Lake No, the Khor Mayyeh Nur enters on the left. It is very shallow, but its width at the mouth is 150 to 200 yds. It appears to drain the swamp at the foot of the Bahr el-Homr. Just before reaching the west end of Lake No, the Khor Deleb, with a channel 150 to 200 yds. wide, enters from the south, after running parallel with the main river for about 15 miles. The mouth of the Bahr el-Ghazal, where it enters Lake No, is only about 40 yds. wide, with an average depth of 8 ft. (March).

*The Bahr el-Homr.*—The Bahr el-Homr is said to rise some 30 miles across the Darfur frontier. It flows east to Hasoba, traversing the south-west plain of Kordofan, north of and parallel to the lower course of the Bahr el-Arab. At

Hasoba it turns south-east, and loses itself in the great swamps north of the Bahr el-Ghazal. The Bahr el-Homr flows through a level plain and drains a narrow area. Its average width is about 100 yds. It receives on its left bank several khors, of which the most important is the Khor El-Keik, draining Lake Keilak. Its lower reaches, east of long.  $29^{\circ}$  E., where it is known as the Gnol or Raguba, are fringed by permanent swamps. During the dry months (January–April) wells are dug in its bed, from which the Dar Homr tribes water their numerous herds.

*The Bahr el-Arab.*—The Bahr el-Arab, perhaps the most important of the many rivers by which the Bahr el-Ghazal is fed, is also known as El-Gurf, El-Rizeigat, or Kir. It is composed of two rivers, the Adda and the Umbelasha, which meet at a point 50 miles north-north-east of Kafiakingi, after which the combined stream takes the name of Bahr el-Arab. Both rivers have a very slight fall for 2 or 3 miles before they meet, and at the junction a natural rock dam arrests the flood in its earliest stages.

The *Adda* or *Obo* is the larger of the two and carries twice the volume of the Umbelasha in flood time. It rises in the uplands of Dar Fertit, and has an average width of 250 ft. with 15 ft. banks. Its bed is sandy, and rocky in places, and water in pools is found throughout the year. In June the breadth of water is 60 ft., and depth 3–4 ft. Its tributary the Siri joins it 20 miles above its meeting with the Umbelasha. In June the breadth of the Siri's bed is 150 ft., of its water 12 ft.; its banks are 8 ft.; the depth of its water one foot. In flood it is 6 ft. deep. The Rikki joins the Siri near the Adda junction. Its breadth (June) is 45 ft.; its banks 10 ft. high; depth of water 3 ft.

The *Umbelasha* also rises in the Dar Fertit uplands and flows by the disused copper-mines of Hofrat el-Nahas. Its average width is 150 ft. with 15 ft. banks. It becomes deeper and narrower as it nears the Adda. In June its depth is some 6 ft. and its current  $1\frac{1}{2}$  mile an hour. The bed is chiefly sand, or, in a few places, rock ironstone. The upper reaches

are dry in the dry season, but water is then easily obtained by digging.

The Bahr el-Arab derives much of its water from the streams draining the southern slopes of the Jebel Marra range (Darfur). This country has not yet been fully explored. Further investigation may show that the main branch of the river descends from this direction, in which case the Adda and Umbelasha must be tributaries entering from the south. In its course below the junction of these two rivers it is a fine river pursuing a tortuous course eastwards along the 10th parallel for some 400 or more miles, to its junction with the Bahr el-Ghazal 30 miles north of Meshra el-Rek. Before it enters the swamps, about 45 miles above the junction with the Bahr el-Ghazal, it has a width of 70 to 120 yds., and a depth (November) of 3 to 6 ft. The Lol flows into it near this point. The unexplored upper reaches of the Bahr el-Arab are reported to contain open water throughout the year, at any rate in pools, and it flows between good sound banks. It has been navigated for about 100 miles above the Lol junction, and in flood possibly boats might reach as far as Hofrat el-Nahas on the Umbelasha. Below the Lol junction it is at present hopelessly choked with sudd. Near its mouth in January 1906 it was 100 yds. wide with a depth of water varying from 20 ft. in the centre to 25 ft. close to either bank.

*The Lol System.*—Various rivers flow from the western and south-western hills to join the Bahr el-Arab (some 30 miles above the junction of this latter river with the Bahr el-Ghazal) by the one channel of the Lol River. The name Lol is given to the combination of the Chell and Boro Rivers, which meet to the north of Chak Chak near Nyamlell.

The *Chell* or *Kuru* rises in Dar Fertit, some 50 miles south of Dem Zubeir, and flows north. In its upper reaches it has an average width of 25 yds. with banks 25 ft. high, and flows through rocky and hilly country. Between Chak Chak and its junction with the Boro, a distance of 80 miles, the channel winds considerably and has some sharp bends. Here it flows through marshy country with the exception of four



rocky stretches, the longest of which is half a mile. There are rapids here between December and June, of little impediment during the flood. The river varies greatly in depth, being from 12–15 ft. deep in flood, but standing in pools in April or flowing with scarcely half a foot of water. The breadth of the bed is from 60–100 yds. Its banks are 12 ft. high above low water. Its tributaries are the Biri and Bibi.

The *Boro* rises in the watershed west of Said Buldas and flows east to its meeting with the Chell. Only a stream in the dry season, it becomes a river with a strong current flowing between high banks when in flood. In April 1909 near Said Buldas it was 65 yds. wide, 8 ft. deep, in a rocky bed. Near Telgona in July its breadth was 80 yds. and its banks 8 ft. high. Its chief tributaries are the Sopo and Raga. The Raga rises to the south-west of the Mungaiat hills and flows north-east into the Boro. In flood it is a formidable obstacle to travellers, but in March it is only 2 ft. deep. At Raga station it is 100–150 yds. broad with banks 15 ft. high, and flows in a sandy bed. The *Sopo* rises in the watershed to the east of the Raga. In flood it is a fine river some 300 yds. wide with steep banks and a strong current. By February it is only 2 ft. deep. In July the breadth of water is 180 ft., depth 4 ft., banks 6 ft. high, current  $1\frac{1}{2}$  mile an hour. In the dry season it ceases to run.

The *Lol* River itself, a combination of the Chell and Boro, is in flood (July–December) a fine river with an average breadth of 200 yds. There are, however, many sandbanks, and much sudd would have to be cleared away for 40 miles above its entry into the Bahr el-Arab before it could be navigated. In the dry season it becomes an insignificant stream, with a depth varying from a few inches to 20 ft., and a scarcely perceptible current.

The chief tributary of the Lol River proper is the Pongo (Bongo, or Gi). The *Pongo* rises in the watershed to the south of Dem Bekir and flows north-east. At its source it varies from 10–20 yds. in width, with 10–20 ft. banks and a sandy bottom. In March 1905 the flow of water had ceased and

the water stood in pools. Where crossed by the Wau-Dem Zubeir road it was fordable in February 1910 with steep banks. Some 40 miles to the north, at the intersection of the Wau-Chak Chak road, it was fordable in January, and water was flowing here slightly at the beginning of April through banks 20-30 yds. apart (1910). From this point to its junction with the Lol, over 90 miles, the Pongo flows through an open valley 1-3 miles broad which opens out into a flat and swampy plain through which it proceeds slowly to the Lol.

*The Jur System.*—Two considerable rivers, the Wau and the Sueh, combine a few miles south-east of Wau to form the Jur or Agur River, the most important tributary of the Bahr el-Ghazal; which then flows successively north, north-east, and east, and enters the Bahr el-Ghazal River at Lake Ambadi.

The *Sueh*, which is the principal branch, is fed by a number of small streams which rise in the Tembura and Yambio districts of the watershed. In its upper course it flows north, by Khojale and the Raffile Rapids (lat.  $6^{\circ} 50'$  N.) through a deep ravine filled with dense forest, descending over 2,500 ft. between  $4^{\circ} 25'$  and  $7^{\circ} 20'$  N. lat. At this point it enters its valley-tract, and meanders, with a maximum width of 200 yds., between alluvial banks through a wide flood-valley bordered at a distance by low ironstone hills. At about lat.  $8^{\circ}$  N., these ridges vanish and the valley becomes a savannah plain. The river banks are flatter and at mid-flood are covered, when large areas of the plain are inundated. The stream bed narrows to 30 yds., splits into several branches, and finally loses itself in the swamps. Between August and November, however, the river is navigable by steamers as far south as Raffile (about 60 miles above Wau) and probably as far as Khojale by lighter craft. The Sueh joins the Wau River a few miles south-east of Wau station. Its main tributaries in the upper reaches are the Wo, Yubbo, and Lingassi rivers; in the lower the Bikki, Yebbo, and Bo.

The *Wau* is a smaller stream, formed by the junction of the

Nomantilla with the Busseire north of  $7^{\circ}$  N. lat. about 80 miles by water above its junction with the Sueh. Throughout this 80 miles the river is 40–50 yds. wide (September 1907) with thickly wooded banks and a good stream which, except in one or two places where there are sandbanks, presents no difficulties to navigation. The curves are generally easy. The lower course traverses a broad flat valley, which is flooded in the rains for several hundred yards on either bank ; but in the dry season the river is reduced to a trickle connecting a series of pools. The Nomantilla and Busseire rise in the Tembura district of the watershed, and would be navigable but for overhanging trees. The current in both rivers runs 2–3 miles an hour in flood, 20–30 yds. wide between high banks, with a depth of water of at least 12 ft. The Busseire near its source is 22 yds. wide with banks 20 ft. high and a sandy bed.

The River *Jur* itself, composed of the Sueh and Wau and receiving the main drainage of the Nile–Congo watershed, is most important for the communications by water between the Bahr el-Ghazal Province and Khartoum. In its upper course south of  $8^{\circ}$  N. it flows north through a wide flood-valley. At about  $8^{\circ} 45'$  N. it makes a sharp bend to the east and with greatly reduced width and depth enters the swamps through which it drains into Lake Ambadi some 20 miles north of Meshra el-Rek. After several years' labour a channel was cleared through the sudd, and the river has for the last dozen years been open for navigation from its mouth to Wau during the months August–November in normal years. The earliest date on record on which a steamer reached Wau was June 18, 1911. The regular steamer service is sometimes suspended about the middle of September to avoid risk of the boat being cut off by sudd movements in the Bahr el-Ghazal. The height of the river at Wau in the beginning of August is usually over 10 ft. Wau itself is 898 miles by water from Khartoum and 150 miles beyond Meshra el-Rek.

*The Eastern or 'Swamp' Rivers.*—(i) The *Ibba* or *Tonj* (called Ibba in its upper course) rises in the watershed near

Mount Baginse (lat.  $5^{\circ} 15' N.$ ) and trends first north-west and then north. While still known as the Ibba it is in places 15–20 ft. deep during the flood, but is fordable in the dry season. The banks are steep, wooded, and difficult to bridge. In June 1870 at Mbomo Zeriba, Schweinfurth found it 28 yds. wide and nowhere less than 10 ft. deep. It enters its plain tract at about lat.  $7^{\circ} 10' N.$ , and here flows between precipitous banks, with a width varying from 10 yds. (April) to 60 yds. (November). In the wet season (July) Schweinfurth found the valley flooded to a depth of 3 ft. for 2 miles from the left bank. Near Tonj in April the river was about 130 yds. wide and 4 ft. deep. Beyond Tonj it turns north-east, and is soon lost in the swamps 60 miles south of Meshra el-Rek.

(ii) The *Meridi* or *Gell* rises in Jebel Ambeh to the west of the Nam about 30 miles south-east of Meridi Post. It flows nearly due north for 150 miles to Gell Post, where it turns north-east and then north again to lose itself in the marshes south of Meshra el-Rek. In flood it is a fine river. In April 1907 where crossed by the Tonj–Rumbek road it was 110 ft. wide, 4 ft. 6 in. deep, with banks about 5 ft. above water-level.

(iii) The *Nam* or *Rohl* rises in Jebel Ambeh in the watershed to west of the Yei River (c. lat.  $4^{\circ} 30' N.$ ) and flows in a north-east direction past Mvolo to perish in the swamps east of Rumbek. Water flows all the year round in its upper reaches, which have the character of a mountain stream, with waterfalls and several rapids. Here its banks are high, 12 ft. above the bed, and it is some 300 yds. wide. This upper course is liable to a swift rise in flood, but quickly subsides. In February 1907 the actual channel was only 15 ft. wide and  $1\frac{1}{2}$  ft. deep. At Mvolo ( $6^{\circ} 10' N.$ ) in its valley-track, it flows between high banks, described as 6 to 8 ft. above water-level in July and 18 ft. in December, and has a breadth variously reported as 90 yds. (July) and 25 yds. (December). At Ayuk, 33 miles north of Mvolo, it enters its flood-plain and flows in a bed about 45 yds. wide with low banks through savannah, which is inundated during the rains. In July 1877 the flood was

here 180 yds. wide and 6 to 7 ft. deep. In its upper course the Rohl receives as tributaries the Ire and the Yolo. The former is unfordable in flood; in June 1910 it was 35 ft. wide and 4 ft. 6 in. deep. The latter at the same time was 40 ft. wide and 3 ft. 6 in. deep, with swamps on either bank; in places it is said to flow in a deeper channel between thickly wooded banks.

(iv) The *Yei*, *Lau*, or *Rodi* rises in the watershed south of Libogo in the Lugwara district (lat.  $3^{\circ} 30' N.$ ). Thirty miles from its source it is a swift and rocky mountain stream 25 yds. wide, and descends in rapids for the next 20 miles. Its channel then improves and it flows between steep-cut banks of soft loam, through dense sub-tropical forest; but other rapids follow, and in places it is quite unnavigable as far as Wandí (lat.  $4^{\circ} 30' N.$ ) where it is nearly 50 yds. wide and 4 ft. deep (February). It is here joined by the *Tori* (30 yds. wide at its mouth). For the next 100 miles it flows through a country of poor stony soil with rapids at frequent intervals, gradually developing into a splendid river with sandy bottom and clean banks. At Wayo (lat.  $4^{\circ} 45' N.$ ) the bed is 120 yds. wide; and at Amadi it broadens to nearly 200 yds. The river here flows through flat plains covered with mimosa bush and savannah, between well-defined banks about 15 ft. high. As it proceeds north the channel contracts. At Gnopp (lat.  $6^{\circ} 15' N.$ ) where it enters the marshes, it was found to be 18 in. deep and 25 yds. wide at low water (March 1910) with a well-marked sandy bed. After a total northward course of over 200 miles, it loses itself in the swamps a few miles north of Lau (lat.  $6^{\circ} 45' N.$ ), some 40 miles to the west of Shambe on the Bahr el-Jebel, with which it is connected by a belt of swamp. There is no certain waterway through this morass from Lau to Shambe, and it is doubtful whether much of the water of the *Yei* ever reaches the Nile.

#### *The Assua (Asua)*

The Assua is by far the most important tributary of the Nile south of Gondokoro; it has a total length, according to

one estimate, of some 167 miles, according to another, of about 248. It rises in lat.  $2^{\circ} 20'$  N. in the Suk Mountains which form the dividing ridge between the drainage of the Nile and of Lake Rudolf. It drains a large area of country and has numerous affluents, of which the Bugger and the Atappi are the most important. It is a perennial stream and although it shrinks at times to a very insignificant limit it never actually runs dry ; in flood it discharges a very large volume of water into the Nile. The slope of the bed is very rapid, and the river is said to be subject to sudden increases, rising as much as 16 ft. in a few hours ; the floods subside almost as quickly as they rise. The Assua flows in a deep, densely-wooded gorge. In its upper course it is described as being 44 yds. wide, with broad sandbanks and numerous granite boulders in its bed. About 15 miles above its junction with the Nile, it is rather over 30 yds. wide and 3 ft. deep, with banks about 6 ft. high. Near this point there are hot springs on the left bank and in the river bed. The Atappi joins the Assua from the north-east at about 3 miles above the junction of the latter with the Nile.

#### INDEPENDENT RIVERS

There are two rivers in the eastern Sudan quite independent of the Nile system, the Gash and the Baraka. They are of great economic importance (see 'Irrigation').

##### *The Gash*

The Gash, known in the upper part of its course as the Mareb, is a torrential river, only flowing between the beginning of July and the end of September ; throughout the remainder of the year its bed is absolutely dry.

It rises a little south-west of Asmara in Eritrea, near the hill of Takara at an altitude of about 6,560 ft., and flows at first in a south-easterly direction, then south and south-west as far as its junction with the Belesa ; it then turns west and later north-west. It drains the northern part of Abyssinia

and a small portion of southern Eritrea and carries this drainage as far as Kassala, a distance of about 332 miles from its source.

The Gash enters Sudan territory between the mountains of Anderaib and Abu Gamal, some 20 miles south-south-east of Kassala. At Kassala, which is situated on its right bank, the river is 160 yds. broad with a flood-depth of 3 ft. ; its bed here is sandy and its banks are low, and often flooded. There are a number of spill channels, some of them fairly large and well-defined. North of Kassala these spread out into a fan, forming an alluvial delta, the waters laden with fertile sediment sinking into the flat soil. Cultivation is carried on here, and there are thick growths of tamarisk, acacia, and shrubs, succeeded by a belt of tussocky grass. Six or seven miles beyond Kassala, the main river section entirely disappears, obliterated in its own silt, but the channels collect into two or three considerable and distinct drainage lines leading in a north or north-western direction. These are usually marked on maps as branches of the Gash ; they flow for 50-100 miles, irrigating large grazing areas, but it is doubtful if any of them reach the Atbara, though a depression running in just north of Adarama has been supposed to connect with the Gash. The most important channel flows due north past the village of Filik.

Water can be obtained almost anywhere within the area affected by the Gash flood, at a depth of some twenty feet. During the flood the current is very rapid, and the ford at Kassala is sometimes impassable for several days at a time. The flood usually reaches Kassala during the first week in July ; the flood-discharge does not exceed 100 cubic metres per second.

### *The Baraka*

The Baraka (Barka) is a torrential river, rising to the south-west of Asmara, in the same mountain-group as the Gash. Of its total course of 390 miles, 267 lie in Eritrean territory. It bears several other names during portions of this course.

With its chief tributary the Anseba, which joins it on the right bank at about lat. 17° N., and the course of which, about 200 miles long, lies entirely in Eritrea, it forms the chief river of that colony. The confluence of another tributary, the Dada, forms a point on the Sudan-Eritrean frontier line, and the line thence follows the course of the Baraka in a north-western direction to its confluence with the Ambakta (82 miles south of Tokar). From this point the Baraka flows north, slightly trending to west, through Sudan territory to Tokar, receiving on its left bank the Khor Langeb, about 50 miles south of Tokar. Several other small khors, e. g. the Toshikh and Lokweb, drain into it from the mountains and cut out channels in its sandy bed.

Below Tokar the Baraka forms a delta, traversed by twelve to fifteen channels, of which only one, the Antiteb, seems ever to reach the Red Sea, and even that in exceptional years only ; it is described as large and deep in flood time. Another, the Akwetid, is often dry even then. These channels are constantly silting up and fresh ones being formed. The delta is flooded twice or more successively during September, following on an intermittent flow of flood-water in the previous six weeks ; the flood-water is red-brown in colour, and the mud deposited is very fertilizing, enabling rich crops of cereals and cotton to be grown.

During the rest of the year, the flat, hard, sandy bed of the Baraka resembles a highway, and is used as such ; there are frequent pools and wells, and patches of cultivation in places. In the dry season, water can be obtained almost anywhere close under the surface. The banks are thickly covered with tamarisks, dom palms, and other trees ; in places they are steep, and from 10-12 ft. high. The valley winds and curves considerably, sometimes skirting hills, as e. g. between Karabat and Terdemia.

#### VEGETATION

With a climatic range extending from the extreme aridity of the Sahara to the long rainy seasons and steamy moisture



of the equatorial forest, and soils varying from sand through stiff clays to ferruginous laterite, the vegetation of the Sudan includes many different plant associations. The desert, steppe, marsh, savannah, and forest types are all found; among flowering plants alone, nearly 700 genera, some represented by numerous species, have been identified. Generally speaking, the plant distribution is entirely governed by moisture and little affected by altitude; though certain hills (e. g. Nuba Mountains) have a flora of their own. Progressive enrichment of vegetation accompanies the increase of rainfall from north to south and east, whilst a marked intensification of the plant life is seen on the banks of the Nile and its great affluents, which are frequently bordered by distinctive riparian forests. From the point of view of the systematic botanist, the wide diffusion of leguminous, composite, and convolvulaceous plants is specially noticeable. The Leguminosae are represented by the numerous acacias, which are perhaps the most characteristic and widely distributed plants of the Sudan, including large timber trees such as sunt (*Acacia arabica*) and kuk (*A. verigera*), the gum-bearing hashab (*A. vereke*), and talh (*A. seyal*), and spiny scrub such as the samr (*A. tortilis*) of the desert zone, and the kittr (*A. mellifera*) of the south. To this order also belong some of the largest trees of the sub-tropical forests, such as the mudus (*Parkia filicoidea*), kuru or redwater tree (*Erythrophloeum guineense*), eriang ( *Berlinia acuminata*), taraya or digdig (*Pterocarpus lucens*), tamarind or ardeib (*Tamarindus indicus*), and frankincense tree (*Daniella thurifera*). The Compositae are represented by numerous herbs, and the Convolvulaceae by a multitude of twining and climbing plants.

Though the flora of north and south differ widely, a few of the more accommodating species are found throughout the Sudan. Conspicuous among these are the acacias, the dom palm (*Hyphaene thebaica*) and gameis or edible sycamore fig (*Ficus sycomorus*), which grow everywhere near running water, the heglig (*Balanites aegyptiaca*), a tall spiny tree giving hard timber and edible fruit, the araka or mustard tree (*Salvadora*

*persica*) and the common African shrub ushar (*Calotropis procera*).

There are many plants of economic value, but with the exception of the gum acacias, these have so far been little exploited. In the southern forests are valuable timber trees, including substitutes for mahogany (*Khaya senegalensis*) and ebony (*Dalbergia melanoxylon*). Many species give oil seeds, fibre, resins, and tanning bark. The rubber vine (*Landolphia owariensis*) grows on the ironstone plateau. Cotton and indigo are indigenous. Amongst the numerous wild plants used by the Arabs in medicine are senna (*Cassia acutifolia*), colocinth (*Citrullus Colocynthis*), and the castor oil bean (*Ricinus communis*). All these products may have a commercial future, if the present difficulties of transport are overcome. The more valuable trees and plants are now strictly protected. By the Forests Ordinance of 1908 and subsequent regulations, any land at the disposal of the Government may be declared a reserved forest within which the felling or injury of trees, cutting of firewood, trespass, pasturing of cattle, making of fires, hunting and setting of traps are forbidden, except by permit. Such a reserved forest, 24 square miles in area, was created in 1912 on the Khor Baggari between El-Obeid and El-Rahad, and is known as the El-Obeid Fuel Reserve. On all public land the above acts, together with the collecting of wild rubber or gum, are regulated by the Director of Woods and Forests, who may declare any area, tree, or class of tree, 'reserved'. Sunt, tamarind, and rubber vine are thus reserved in all districts; Sudan cedar in Bahr el-Ghazal, Mongalla, and Sennar; Sudan mahogany, zawa, and lulu in Bahr el-Ghazal and Mongalla; and dom palm in Berber, Kassala, Sennar, and Mongalla. Wild senna is protected and may not be rooted up or broken wherever found. In Red Sea Province the leaves may not be picked between April and September.

The regional botany is best studied in three parts: (1) the desert zone, lying north of Khartoum and Kassala, with a predominating sandy soil, producing low-growing xerophiles;

- (2) the intermediate zone between lat.  $11^{\circ}$  and  $15^{\circ}$  N., distinguished by a stiff clay or 'cotton' soil, mixed in the north with granitic sand, and bearing extensive acacia forests, and in the south timber forest and good but ephemeral pasture ;
- (3) the tropical zone south of lat.  $11^{\circ}$  N., characterized by long rains, rich soils, and forest, savannah, and swamp vegetation of the sub-tropical type.

### *Desert Zone*

The region north of lat.  $15^{\circ}$  N. is a country of deep sands, over the greater part of which the rainfall does not exceed 4 inches annually. Hence trees can only live on the river banks and in the beds of the wadis, where their roots reach down to the water table and conditions favour open associations of thorny scrub and desert grasses, able to resist long periods of drought. Large areas of the Libyan desert are utterly barren ; but patches of succulent plants and desert grasses occur between the Abiad plateau and the Nilé, and good camel fodder—chiefly sellem (*Acacia Ehrenbergiana*), tumam or shooh grass (*Panicum turgidum*), and halfa (*Desmostachya cynosuroides*)—is found in the Natrun and other oases. The uncultivated tracts along the Nile banks from Dongola to Merowe are often thickly clothed with coarse grass and trees, chiefly tamarisk (*Tamarix gallica*), large haraz and sunt acacias (*Acacia albida* and *arabica*), and the dom and date palms. The backlands and the depressions of the Bayuda desert, between the Wad el-Melik and the Nile, are covered with grass and thorny scrub—mainly samr—and dotted with occasional trees, including talh, sunt, and heglig 20 to 25 ft. high, araka, and tundub (*Capparis aphylla*), a spiny shrub 15 ft. high. Where water is near the surface, the dom palm, ushar, and marakh (*Leptadenia Spartium*) flourish. The young branches of samr and succulent marakh leaves are good camel fodder. The wood of the sunt is much used for sagias. Heglig, tundub, and samr branches are excellent fuel. Senna grows wild and is gathered for sale in this region.

East of the Nile the Atbai desert exhibits several special

botanical features. Though the vegetation is generally sparse, consisting mainly of sellem scrub, in many of the wadis—especially those of the eastern slope—it becomes surprisingly rich. Even in the western water-courses, fine green trees of araka, heglig, sayal, and marakh flourish; and there are thickets of the rare palm *Medemia Argun* (often confused with the dom), which produces a useful matting fibre, and fruit tasting like ginger-bread. The eastern wadis contain many large trees of sayal, heglig, tundub, and gameis. The herbs and undergrowth on this slope are said by the Arabs to possess greater medicinal powers than those on the west. Balm of Gilead (*Commiphora opobalsamum*), much used in Cairo as a medicine, grows on the coast near Suakin. Good grazing is found in all the depressions of the Atbai for some months after rain.

The region between the Berber-Suakin road and lat. 15° N. is a mixed country of sandstone and cotton soil. The sandy tracts in the north produce only coarse grasses and thorny scrub. On the cotton soil acacia and tundub grow plentifully in the wadis; and the lemon-scented mahareb (*Andropogon sp.*), several species of *Eragrostis* and other fodder grasses are seen everywhere. East of the Atbara, the principal khors descending from the north-easterly hills are bordered by dom palms. The Gash, between Filik and Kassala, is fringed with tamarisk forest, and north of Filik, by acacia scrub. Except in the khor beds, vegetation in the whole of this region withers a month or two after the rains, and the greater part of the surface becomes barren and desolate.

### *Intermediate Zone*

The outstanding characteristic of the intermediate zone, between lat. 11° and 15° N., is the great development of the acacia forests, especially in Kordofan. North of the 14th parallel and west of El-Obeid, owing to the sandy soil and slight rainfall, these forests consist of stunted trees, mostly kittr-bush, sayal, and samr, mixed with meika (*Dobera Roxburghii*). They give good camel pasture, and material for hut-building, rope-making, and fuel. The gafal (*Commiphora*

*africana*), producing an incense resin, is found in this zone. Between lat.  $12^{\circ} 45'$  and  $14^{\circ}$  N. is the region of the valuable gum-bearing grey acacia, or hashab, which grows in open woods over the whole of it. These woods, when private property, are carefully tended and guarded from fire. Gum from such protected plantations, known as hashab-geneina, fetches a higher price than hashab-gezira, gathered in the open forests. The finest plantations are between El-Obeid and El-Dueim.

After the acacia, the most important tree, especially in west Kordofan, is the baobab or tebelidi, which often grows to a great size. Its hollow trunk is regularly used as a water reservoir. A fine specimen, varying from 10 to 25 ft. in diameter, will hold a column of water 20 ft. high, and this remains sweet until the end of the hot weather. Some of these trees, being open at the top, fill themselves. These are called El-Lagat, and are specially prized. Others must be filled by hand from pools formed at their base during the rains. Good tebelidi trees are a valuable property, and may be let or sold. The sale of their water to caravans is a lucrative trade. They are specially numerous in the Nahud district, and on the main routes from El-Obeid and Shidira to Nahud town. A fibre, used for nets and ropes, is obtained from their bark.

The Nuba Mountains have a distinctive flora. The principal trees are said to be three resin-yielding species of Burseraceae (probably *Commiphora africana* and *pedunculata*, and *Boswellia papyrifera*); the gughan (*Maba abyssinica*) giving a fine dark wood used for gun-stocks, the edible caper (*Capparis spinosa*), and tall bamboo or ganna (*Oxytenanthera abyssinica*).

Belts of forest, principally sunt, border the White Nile and its main khors, north of lat.  $12^{\circ}$  N., with open woods of heglig, hashab, and talh on the backlands. These sunt forests, which flourish wherever the land is subject to annual flooding, have considerable value, though their gum is commercially unimportant. The timber, which is heavy and durable, is used for boat and hut-building, the pods and bark

for tanning. The ambatch (*Herminiera elaphroxylon*), the characteristic tree of the swamp country, extends south from Abba Island. Its light, pithy stems are used for making rafts and canoes.

East of the Nile the vegetation of Sennar, Blue Nile, and South Kassala provinces consists mainly of grasses and bush growing on the Gezira and cotton soil plains, and riverain forests bordering the Blue Nile and its affluents. Both forest and savannah become gradually more luxuriant as the Abyssinian highlands, with their rich alluvial earths and heavier rainfall, are approached. In the Gezira and Gedaref regions, the whole of the uncultivated surface is covered with grass and herbage. In Gezira the dominant species are the naal or couch-grass (*Cynodon dactylon*), mahareb, aada (*Andropogon halepensis*), and hemeira (*Eragrostis aspera*), and various creeping convolvulaceae known collectively as hantut. All these are good fodder. Between Kassala and Gedaref there is much mimosa scrub, often 10 ft. high; elsewhere the Butana plain is mainly grassland, covered after rain with a dense and tall savannah growth which near Gedaref is mainly coarse aada-grass, varying from 3 to 15 ft. in height. The hilly country to south and south-east is enveloped in forest, yielding a good deal of gum.

The lower reaches of the Blue Nile, Rahad, and Dinder rivers are bordered by a dense and often impenetrable thorny jungle. That of the Dinder is specially rich, and contains some of the finest sunt trees of the Sudan, which encroach on the channel and are a serious obstacle to navigation. Below Hawata they give place to gemeiz. Wild cotton and castor-oil plants grow for many miles along the banks. On the lower Blue Nile the principal trees near the river are large tebeldi and tarta (*Sterculia cinerea*), Nile willow (*Salix safsaf*), the twigs of which are used for basket-making, talh, and tamarisk. On the upper courses of these rivers the region of great forest trees is reached. A comparatively small number of species is represented, chiefly large sunt and talh, the babanus or Sudan ebony (*Dalbergia melanoxylon*), the tall, graceful silag

(*Anogeissus leiocarpus*), dom and deleib palms, tamarind and tamarisk, khash-khash (*Stereospermum Kunthianum*), and dabkar (*Crataeva religiosa*). On the upper Blue Nile near Roseires the babanus abounds; tamarinds grow to a great size here, but their trunks are usually hollow, and useless as timber.

### *Tropical Zone*

The region approximately south of lat.  $11^{\circ}$  N., with a preponderance of rich clay soil and a heavy rainfall, is favourable to a luxuriant plant life; and, except in the short dry season when herbage withers, is densely clothed with forest, savannah, and marsh plants. The general form of the surface, a wide shallow basin draining from every direction to the Nile, conditions the distribution of the flora. Three distinct zones of vegetation can be distinguished: forest and parkland upon the outer rim, i. e. south Kordofan, the plateaux of the Nile-Congo watershed, and the mountains of the eastern and southern frontiers, where the drainage is comparatively sharp; savannah, with fewer trees, in the flood-valleys and annually irrigated lands; and swamp vegetation in the sudd area, or waterlogged region at the bottom of the Bahr el-Ghazal depression.

The forests, which cover a large area in south Kordofan and Nuba Mountains Provinces, on the Bahr el-Jebel south of Mongalla, and on the upper and middle courses of the rivers descending from the Nile-Congo watershed, are mainly of the sub-tropical type; they form open associations, with thick grassy undergrowth, which attains a great height in the rains, and shed their leaves in the dry months. But in the extreme south, where the rainfall exceeds 40 inches annually, patches of tropical evergreen forest are found. All the forests have suffered greatly in the past from fire; the annual burning of the undergrowth by natives, and the neglected local fires of travellers and hunters, have destroyed seedlings and young trees on a large scale. Large patches of stunted and contorted growths are common, and fine well-developed timber is the exception, not the rule. The forests are now

protected by ordinances and inspection. An area of nearly 250 square miles, mostly in Sennar province, is reserved and delimited.

In south Kordofan the forest consists mainly of big kuk and talh acacias (*A. verigera* and *A. sayal*), heglig and gughan, which flourish on the heavy black clay, and of various timber trees such as silag, dabkar, and subakh (*Terminalia cycloptera*). The savannah plants of this region include several which are poisonous to camels, notably the creepers gulum (*Capparis tomentosa*), the leaves and fruit of which are harmful, the wild liquorice or habilarus (*Abrus precatorius*), with poisonous red and black seeds, found chiefly in Dar Homr, and a mauve convolvulus with dark leaves found at the foot of the Nuba Mountains. This is known as um bireiganga, saloki, or sakran. Um tabitsh, which poisons horses, donkeys, cattle, and sheep, but not camels, is a plant 12-18 inches high bearing two to four prickly seed heads. It is harmless during the rains, and only becomes injurious when the fruit is dry and hard. It grows on stony ground south of lat. 13° N. In the extreme south of the province, many of the large trees found in the Bahr el-Ghazal forests occur: such as abu surug (*Prosopis oblonga*) giving a hard red wood and tanning bark, gere (*Hymenocardia acida*), *Sterculia tomentosa*, yielding fibre and a valuable gum, and duruba or Sudan cedar (*Soymida roupafolia*). A similar range of clay-loving species is found in the river valleys of the lower ironstone plateaux, especially south and west of Wau, where the forest is dense and widespread. The chief trees here are the talh, heglig, gughan, tamarind, sausage tree or um shutur (*Kigelia aethiopica*), and zeitum (*Vitex Cienkowskii*). The mudus (*Parkia filicoidea*) and frankincense tree or shande (*Daniella thurifera*) grow to an enormous size in the flat land near Tonj and Wau; and the bili (*Irvingia Smithii*), giving an edible fruit and good boat timber, on the banks of the Sueh and Jur. The kwel (*Ficus platyphylla*) is generally distributed and specially abundant between Wau and Meshra el-Rek. Several species of ground orchid grow under the trees. The forests on the rocky upper



terraces of the ironstone plateau differ considerably from those in its lower valleys. Here there is little acacia or thorny undergrowth. The many large trees include the enormous and valuable homraya or Sudan mahogany (*Khaya senegalensis*). The lulu (*Butyrospermum Parkii*) or shea-butter tree, giving a fruit called Sudan dates, which is a staple food, and a valuable oil seed, is especially abundant near Rumbek. The taraya or digdig (*Pterocarpus lucens*), giving strong timber; Sudan teak or zawa (*Lophira alata*), with a fruit yielding an abundance of pure oil; erianganga or koba (*Berlinia acuminata*), mudus, and abu surug are also important. Bamboos and the kuru bei, or red-water tree (*Erythrophloeum guineense*) line the banks of the khors. The most valuable product of the ironstone forests, however, is the rubber vine ndala or odilo (*Landolphia owariensis*), which grows in rocky places. A variety, the dungo (*L. Petersiana*), which grows to a larger size and has transverse rings on the stem, yields an inferior latex.

East of the Nile, save for occasional belts of trees near the river, the sub-tropical forests are far less extensive than on the west, and there is little information as to their composition. The great plains between the river and the Abyssinian foothills are mostly clothed with savannah. Thick forest and jungle is found in the valleys and ravines of the scattered hills which run south-east from Gondokoro toward the Uganda border, and woodland is reported in the Okela country to the east.

In the upper valleys of the Yei River and its tributaries, south of lat. 4° N., and those of the Imatong range, there are patches of forest approaching the equatorial type. These are marked by evergreen trees of gigantic size, and the total absence of grass. The most important tree economically is a giant mahogany (*Khaya sp.*) not yet classified. Specimens 120 ft. high and 6 ft. in diameter are not uncommon. Large climbers, mostly landolphas, reach to the crests of the highest trees, shutting out all light with their dense foliage. Mosses, ferns, and orchids clothe the huge trunks. Large forests of

male bamboos exist in the swampy ground. In the dense forests of the Imatong valleys magnificent tree ferns flourish. These tropical forests contain a wealth of valuable timber not obtainable elsewhere in the Sudan. The soil and climate are well suited to the cultivation of most tropical plants of economic value. The forests east of the Nile are as yet practically unexplored.

The tree life diminishes in the lower valleys of the rivers descending from the Nile-Congo watershed. On the annually inundated lands which border them coarse grasses flourish, but woods are sparse, and occur mainly as narrow belts on the ridges separating the flood plains. Such trees as exist on the lower ground are usually perched on termite hills above the flood-level. The principal species found in this situation are the tamarind, gughan, dabkar, karmudoda (*Sarcocephalus esculentus*), and angoto or dungo (*Mitragyne africana*). On poor land the shagar el-sim or kakob (*Euphorbia candelabrum*) often grows 40 ft. in height. Its juice is used for poisoning arrows. It forms the chief constituent of the forests on the banks of the Bahr el-Jebel near Lado.

The permanently water-logged swamps or sudd, bordering the Bahr el-Jebel, Bahr el-Ghazal, and their tributaries between lat. 7° and 10° N., and receiving the drainage of the swamp rivers west of the Nile, can only support a marsh vegetation. On the Bahr el-Jebel the dominant plant is the papyrus, often growing 15 ft. or more high, and forming a dense aquatic jungle through which it is impossible to force a passage. It can live in considerable depth of water, and has fibrous roots striking deeply into the ground. With it are associated the common reed or bus (*Phragmites communis*), growing 10 to 15 ft., and the um suf or 'mother of wool' (*Panicum pyramidale*), which rarely exceeds 6 ft. These grow only in shallow water or morass, and propagate by long tubular rhizomes, which play an important part in the formation of the floating sudd-blocks. Many miles of the swamp area are densely clothed with these three plants. A number of small submerged and swimming plants are mingled with them,

and cover the surface of the lagoons : chiefly *Pistia stratiotes* resembling a tiny cabbage, *Utricularia Oliveri*, *Vallisneria spiralis*, and an unclassified variety of *Ottelia*. The loofa plant (*Luffa aegyptiaca*) and sola or pith plant (*Aeschynomene aspera*) grow wild in these swamps.

The character of the Bahr el-Ghazal sudd vegetation differs considerably from that of the Bahr el-Jebel. There is little or no papyrus or um suf. Their place is taken by reeds and tall water grasses, such as *Vossia procera* and *Saccharum spontaneum*. A multitude of long trailing swimming plants breed in Lake Ambadi and the neighbouring lagoons, and thence find their way into the river, where they form blocks. The chief species are *Utricularia exoleta* and *incerta*, *Vallisneria spiralis*, and *Ottelia lancifolia*.

### GEOLOGY

The northern part of the Sudan consists of sedimentary sandstone resting on crystalline rocks, mainly granite, gneiss, and schists, which form the foundation of the whole country. This sandstone formation, called the Nubian sandstone, may be stated roughly to extend as far south as lat. 14° N., thus dividing the Sudan into two zones. The line bounding the sandstone area is by no means uniform. In south-west Kordofan, it reaches to lat. 11° N. Near El-Obeid it does not extend beyond lat. 13° N., and there are points, as for instance on the Atbara, where it comes to an end much sooner.

As to the age of the Nubian sandstone, it is now generally agreed that it belongs to the Cretaceous period. Fossils have been discovered in the sandstone of Upper Egypt which strongly support this view. It is also probably of estuarine origin, and not formed in the waters of an inland lake. The Nubian sandstone often contains hard ferruginous layers, and varies much in colour according to the amount of staining by oxides of iron and manganese. It passes through all shades of yellow, brown, and red. Sometimes the sides of hills are so thickly covered with nodules of peroxide of iron and manganese, as to deceive travellers into supposing that

they are composed of basalt. Lenticular beds of clay are of frequent occurrence, and sometimes extend for miles. In places the soil is derived from other rocks. The soil of Kordofan as far south as the latitude of El-Obeid is almost entirely sandy, a wind-blown sand coming from the north-west and north. The central plains of Kordofan are of cotton soil ; only around the groups of hills may the soil be described as granitic. In the east of Darfur the soil in depressions is nearly always clay.

In many places throughout the whole of the Sudan the underlying crystalline rocks appear upon the surface in the form of mountain masses, isolated hills, dykes, and boulders. These outcrops of rock have been greatly reduced by erosion and denudation. The hills of Kordofan and the Gezira must have been of much greater height in former times, but have been gradually worn down till only the stumps remain. To-day weathering is proceeding rapidly, the rocks being disintegrated by atmospheric agencies acting along the lines of jointing. In a southerly direction from Jebel Marra in Darfur there stretches a broad alluvial plain dotted all over with peaks of granite which give the impression of a range of mountains buried all but its highest points. Jebel Marra itself, a great mountain mass, extending a hundred miles from east to west, and sixty from north to south, is of volcanic origin. It is composed of lava and granite. From the main group there stretches in a westerly direction a dyke of white quartz, crowning a sandstone plateau raised three hundred feet above the plain. This formation continues for a distance of nearly forty miles. Jebel Medob, in the north of Darfur, is of sandstone with granite intrusions, much distorted by volcanic activity. South-west of Bir el-Melh in the same district is an extinct crater, 150 ft. in depth.

The nature of the underlying crystalline rocks is well exposed in the so-called cataracts of the Nile. These are caused by the river (which cuts its way without difficulty through the sandstone), encountering in places ridges of crystalline rock which offered greater resistance to erosion.

In the great gorge of Shabluka (the rocks of which are rhyolite and felsite) the river cuts its way through a mass of felsite which stands up as an isolated block in a plain of gneiss. Here there is no slope, and the term cataract is quite a misnomer. At the cataract of Hannek the ridge met by the river is gneiss with bands of granite. Again, in the Kaibar cataract, it is a low belt of gneiss which has been brought to light by the river having cut its way down through the sandstone. At the Amara rapids the obstruction is a mass of schistose rocks. At Akasha it is gneiss again, where the Nile flowing east and west encounters the gneiss striking north and south. South of Sarras, in the gorge of Semna, a band of red and grey gneiss forms a barrier across the river. The second cataract, near Wadi Halfa, is formed by the river spreading over a wide belt of dark hornblendic gneiss containing intrusions of red granite. There are hundreds of small islands or 'tors' of rock, the surface of the rocks being covered with a black and sometimes highly polished film. A small amount of amphibolite and felspar covers the soil around and among the boulders on the banks.

To the east of the Nile the land generally is much higher than it is to the west, and slopes upwards continuously to the watershed, and the Red Sea mountains beyond. Here a broad belt of metamorphic rocks with igneous intrusions bounds the Nubian sandstone. These rocks flank the sea, and rise into a mountain range which runs parallel to the coast about twenty miles inland until it joins the highlands of Eritrea and Abyssinia. Generally speaking the basement rock on the sea plain is mostly grey granite, which dips rather gently to the west. This is replaced at a higher altitude by gneiss, syenite, mica, talc schists, clay slates, &c. In numerous places the metamorphic rocks are uplifted or pierced by large masses of intrusive rock, principally granite. Jebel Erba, the principal peak, is of red granite in which there are veins of quartz. The quartz is more or less ochreous with oxide of iron, and may be auriferous. Like Jebel Elba, Jebel Assotriba is of fine red granite. The deeply carved valleys of

this range are covered with detritus washed down from the mountains. The maritime plain is formed in the same way, the detritus in places reaching to a depth of a thousand feet. From about forty miles to the north of Port Sudan the coast is narrowly fringed by pleistocene deposits of gypsum and soft sandstone. Hill ranges of gypsum occur upon the coastal plain. The island of Makawa is entirely composed of it. The coast itself is bounded by raised and modern coral reefs, broken here and there into harbours.

Passing now to the geology of the southern half of the Sudan, the general condition south of the line where the Nubian sandstone ceases, is that the underlying crystalline rocks are covered with a blanket of soils differing in composition and depth according to their location. Of these the most interesting is the black cotton soil, so named from its colour and its suitability for the cultivation of cotton. With regard to its extent, it may be said that the northern limit of the cotton soil area is practically the same as that which bounds the Nubian sandstone. It runs from a point about thirty miles south from Khartoum on the White Nile to a point at a similar distance on the Blue Nile, and thence to Goz Regeb on the Atbara, though tracts of black cotton soil are found north of this line. The great level plains along the banks of the Blue Nile are composed almost entirely of this soil. From Abu Haraz on that river to within a short distance from Gedaref, close to the Abyssinian frontier, a distance of 150 miles, is one immense cotton soil plain. It covers the plains of the Kassala Mudirieh, and the whole country southwards from the Gash to the Rahad and Dinder Rivers. On the west of the White Nile the soil of Dar Nuba and Dar Homr is of the same character.

Cotton soil is not generally found where the rainfall is less than 8 inches. It will absorb a large rainfall, and is very retentive of water. It is so fine grained that water will not pass through it to reach a porous rock beneath, should one exist. In the dry season the soil becomes fissured with wide cracks often 6 ft. in depth. In the southern part of the

Gezira there is a species of this soil which does not crack so much and for which the native name is fud or fuda.

The cotton soil of the Sudan bears an exceedingly close resemblance to the 'regur' which covers at least one third of southern India. Both are seamed across in the dry season with cracks of similar size and depth. Both are fine dark soils, highly argillaceous and somewhat calcareous. The cotton soil of the Sudan is to a very large extent a loess, one authority insists that it is entirely loess, blown from the northern sandstone area by the very steady wind blowing eight or nine months of the year. The origin of the cotton soil plains of the Sudan is still an unsolved problem, but there are enough facts to support the theory that wind has been the principal factor. The soil is of remarkably constant chemical and mechanical constituency over vast areas, the presence of rocky masses influencing it for only a short distance from such masses. An analysis of the cotton soil of the Gezira shows a proportion of clay varying from 41.8 per cent. at the lowest to nearly 70 per cent. in some samples. In India 'regur' is found everywhere on the plains of the Deccan Trap country, and in many cases there can be no doubt that it is derived from basalt by surface decomposition. Throughout the immense Deccan Trap area the passage from decomposed basalt into 'regur' can be seen in thousands of sections, and all the alluvial valleys opening out from this area are filled with deposits derived from the disintegration of trap rock. This, however, cannot be the only way in which 'regur' is formed. It is, for instance, found in the valleys of rivers which do not flow from the Deccan Trap country, and in these cases it would appear to be formed by the disintegration of argillaceous rocks. The most fertile forms of 'regur' are due to increased dampness, protection from denudation by rain, and decomposing vegetable matter.

These conditions are largely reproduced for the black cotton soil area of the Sudan. The Blue Nile and Atbara, with their tributaries, flow from the basaltic plateau of Abyssinia, where

there is a heavy rainfall, and vast masses of basaltic lava which cover the surface are continually breaking up under the action of denuding agencies. The argillaceous rocks are also present. The Atbara above Goz Regeb has steep banks of clay, and a yellowish clay is always to be found in the ravines leading up from the river valley to the open plain where the cotton soil begins. The soil by the Rahad is generally a good loamy clay; and in Kordofan, as the black cotton soil area of Dar Nuba is approached, clay predominates more and more. The percentage of vegetable matter is extremely small despite the numerous forests and the many rivers which bring down vegetable matter, because the leaves that fall are decomposed on the surface by the parching sunshine, and the rivers carry their load in deep beds and do not spread over the surrounding country.

The cotton soil covers the crystalline rocks to a depth of sometimes 100 ft.; but all over this area the rocks rise up through the soil like islands. Many of these are of volcanic origin, and their decomposition must almost certainly have had a share in the production of the black cotton soil. Throughout the Gezira and the plain of Sennar isolated granitic hills occur. Granite is the prevailing rock, with micaceous schist and greenstone. The red granite found at Segadi to the west of the town of Sennar is of particularly fine quality. The hills at Geili, east of Khartoum are syenite, those at Nasla felsite. Between Renk on the White Nile and Roseires on the Blue Nile is Jebel Gule, which is composed of a coarsely crystalline granite. All round it the country rises to form a vast dome, ten miles in diameter and covered with shallow cotton soil from the centre of which the mountain protrudes. Jebel Agadi, to the west of Roseires, is composed of fine grained, pinkish-grey granite. From here to the Blue Nile the cotton soil is badly cracked, and contains a considerable percentage of clay. Small isolated granite hills are dotted all over the black cotton soil plains between the Blue Nile and Gedaref, and between the Gash and Dinder. The plain ends within a few miles of Gedaref, which is surrounded



by hills of basaltic rock, outliers of the Abyssinian plateau. Kassala is dominated by a magnificent granite dome, 600 ft. high, the Jebel Kassala. The western foothills of the tableland between the Blue Nile at Famaka and Gallabat are granite and gneiss with diosite, diabase, and hornblende schist. The mountains south of Fazogli between the Blue Nile and the Wadi Tumat belong to the igneous formation, and chloritic slate predominates. The Wadi Tumat is a broad ribbon of sand, 300-700 yards in width, winding through an undulating forest-covered plain of cotton soil. Water appears to be always present within a couple of feet of the surface. From the Wadi Tumat to Jebel Keili on the Khor Offat is a gneissose country. Everywhere is badly cracked cotton soil, with thick bush on hills and plain alike. In all parts of the Sudan the worst cotton soil, badly cracked, with hard sharp edges, is associated either with underlying gneiss or with the mouths of wadis draining gneissose hills or districts. Jebel Keili itself is composed of a coarsely crystalline granite containing hornblende and mica, but the hills between it and the Abyssinian frontier, and south towards Kermuk, are generally separate smooth masses of gneiss.

The country along the Abyssinian frontier from Keili to the Yabus river is of great geological interest on account of the gold obtained there. It is the only district in the Sudan where the natives systematically work the gold-bearing earths. In fact gold-washing is the principal occupation of the natives here. The district consists of a complex of hornblende schists, and remarkable hornblendic granites, traversed by hundreds of veins and dykes of coarse graphic granite and pegmatite. It is the destruction of the pegmatite and graphic granites which gives rise to the gravel-like masses of quartz all over the surface, but it is quite likely that the gold is not derived from those rocks but from the hornblende schist in which they occur. At Khor Kashaya, one mile south of Jebel Kermuk, there is an immense quantity of gold-bearing alluvial. The Khor is 125 ft. wide, and 20 ft. deep. The gravel consists mainly of quartz fragments, but

large rounded pebbles of brown basalt and small pebbles of light green pitchstone point to the occurrence of volcanic rocks in the highlands where this river rises. The banks of the Yabus river are covered with splendid forest on stony gritty soil. West of the river, where it turns south-west, is the cotton soil plain stretching to the White Nile. As the river is approached the soil gets worse. Throughout the Dinka country poisonous alkaline salts are deposited in the soil, and the whole land is in consequence treeless. These salts get washed below the surface by rain, leaving it suitable for grasses and all plants, the roots of which do not seek moisture deep; but at about one or two feet depth the salts have accumulated, and roots drinking water charged with them are killed. Right on the east bank of the White Nile rises the isolated granite hill of Jebel Ahmed Agha. Opposite on the western side of the river, the mountains of Dar Nuba rise from a black cotton soil plain. They consist of large masses with solitary mountains as outliers, and are composed principally of gneiss and schist, though there are large igneous intrusions mainly of granite and syenite. Geologically the hills of Dar Nuba present great differences. Jebel Kadero is chiefly granite with veins of quartz; Jebel Moro is composed of granite and porphyry. Jebel Tagoi is gneiss. Jebel Gulfan, a circular mass seven miles in diameter, has less granite, and is constituted mainly of gneiss, slate, quartz, and graphite. Jebel Tagalle is almost entirely of soft schistose rocks bounded by gneiss on the west. In El-Efein on the south side of this mountain large deposits of impure graphitic material have been discovered.

A narrow belt of plain to the south separates the Dar Nuba hills from Lake No and the Sudd country. Beyond this there is a vast alluvial plain of unfathomable clay, covered in places by a waste of sand to the depth in some localities of 10 ft. The area of this plain is enormous. It extends from the junction of the Sobat with the White Nile on the north to the foot of the equatorial plateau on the south, and from the foothills of Kaffa in Abyssinia in the east to the valley

of the Bahr el-Arab between Deim Zubeir and Shakka, 650 to 750 miles away, to the west-north-west. On the east side of the Nile low hills of granite appear in it from time to time, such as Jebel Zeraf which rises a solitary height in a level land where the Bahr el-Zeraf rejoins the main stream. Others of a similar character crop out on the plains of the Sobat and along the upper reaches of the Pibor. On the Abyssinian border, by the Akobo River, granite appears in the foothills, while basalt overlies it. The appearance of these granite hills above the surface show that the alluvium fills a low depression of which the granite and gneisses of the old land surface form the floor. The origin of the alluvial deposit is still an unsolved problem. The most likely suggestion connects it with the erosion of the hills on the Nile-Congo watershed, and those in Kordofan and Eastern Sudan before they had been reduced and worn down to their present condition. It was certainly not produced by the Nile as it is to-day. The present conditions are depositing coarse sand and gravel in the reach between Gondokoro and Mongalla, and even as far as Bor, but the marshes in the valley intercept the flood-waters, and the material in suspension is soon deposited, so that the building of the flood plains has not advanced far.

On the west side of the Nile, in the Bahr el-Ghazal Province, no rocks of any kind break the surface of the plain. Here its southern boundary may be roughly indicated by a line drawn through the posts of Chak Chak, Wau, and Rumbek to Bor on the Nile. South of this line begins a ferruginous tableland, rising steadily towards the south and west, forming the watershed between the Nile and the Congo, and known as the Azande plateau. On its higher levels the surface consists of red loamy soil, and frequent granite outcrops occur. Beyond Deim Zubeir, where the country rises to a height of 2,282 ft. above sea-level, there are blocks of hornblende, and schist, and masses of red granite. South of Deim Bekir there are plateaux of grey gneiss and ranges of isolated peaks, the worn-down remnants of an

earlier mountain chain. The whole country is composed of ironstone, and the khors and watercourses wear their way through the red soil, and through three layers of iron formation. On the lower slopes of this tableland, down which the western tributaries of the Nile make their way, the soil is a rich black clay underlain by pitted ferruginous stone or laterite, which in its turn rests upon granite and gneiss schists, and is itself the decomposition product of these rocks.

Coming to the valley of the Bahr el-Jebel, the river, from Dufile to Gondokoro, plunges down the last of its steps from the plateau of crystalline rocks, principally gneiss, in a series of rapids. From this point onwards the banks are low, and the width both of the valley and flooded area is large. From Nimule down to Rejaf erosion is wearing away the rock and depositing the material in the river valley. Between the latter place and Gondokoro there is a remarkable outcrop of compact black dolerite dykes, cutting through a well-banded quartz biotite gneiss from south-west to north-east, and forming ridges, in appearance like the ruins of rubble walls, running in almost straight lines at irregular intervals. For a short distance north of Lado the ridge of higher land to the west consists of laterite, containing iron ore, derived by decomposition from the underlying gneiss, which is the predominating type of rock in this part.

To the east of the Bahr el-Jebel spurs and hills and outlying ridges of the central African plateau rise to a considerable height. The geological situation of this area is but little known, since the hilly parts, where it can best be studied, have not been systematically explored. The Imatong-Agoro Mountains, of which the northern portion is within the Sudan, have not yet been surveyed, though they are reported to be largely of granite. Farther to the east are the mountains of Egadung, Harogo, and many others. They are outliers of the central African plateau, of crystalline rock, and show that at one time it extended much farther, but has been cut up into detached masses by stream erosion. On the Abyssinian frontier, the soil on the spurs of the Boma hills is

a red loamy clay ; that on the Ajibo River is of a gravelly nature.

Eastwards from Gondokoro, which lies at the foot of the equatorial plateau, there are low hills of iron clay mixed with quartz, and as the land rises towards the Latuka country grey granite appears. These hills consist principally of granitoid gneiss with occurrences of crystalline schists. Here in the valleys there is a dark brown iron-holding clay. At Okela on the Gyaneti and in the valley of the Koss there is a calcareous laterite deposit, resembling, and probably identical with, the 'kunkur' which is found in parts of India, where it is much used in the building of bridges.

The valleys in these parts, and the hill spurs, run generally from south-east to north-west. This is doubtless due to the main direction along which movements of elevation or folding have taken place. It is, however, possible that intrusions of harder rock have occurred, such as the doleritic dykes near Gondokoro, so that unequal erosion have left in relief the ridges which now divide the stream basins.

### *Minerals*<sup>1</sup>

*Gold.*—There are only two mines where gold is worked, at Um Nabardi, to the east of the Wadi Halfa—Abu Hamed Railway, and, to a much less extent, at Gabait Mine, 150 miles north of Port Sudan. There is abundant evidence to show that gold was once produced in great quantities in Nubia and among the Red Sea Mountains. The ancient workings are never found far removed from areas of igneous influence. Jebel Erba, near which the ruins of a very large gold mine have been discovered, and the hills on either side of the Wadi Gabait are igneous with deep veins of quartz. Alluvial deposits of gold are found near Fazogli on the Blue Nile, especially along the frontier between Jebel Keili and the Yabus River. The Dar Nuba Mountains once produced several gold washings, and gold is still found at Tira-Mandi, where large igneous intrusions occur.

<sup>1</sup> For further details see 'Resources', p. 405.

*Copper.*—Copper is found at Hofrat el-Nahas, one mile west of the Umbelasher, a tributary of the Bahr el-Arab, in the extreme north-west of the Bahr el-Ghazal Province. The statement often met with that there is here an immense quantity of the ore, almost pure carbonate and bi-carbonate of copper does not appear to be well founded. The quantity of ore is unknown. It is not even known if the natives did not work only some metallic native copper found in these deposits; the samples of ore brought to Khartoum by inspectors were of an impure silicate, not a carbonate.

*Iron.*—Iron exists in almost every part of the Sudan. Samples of massive specular ore are found in the Tokar district. Iron is smelted by the natives at El-Nahud in Kordofan, and also to the south of Jebel Karondi. At the latter place heaps of refuse and remains of old furnaces show that the industry must have been carried on for many years. There are also ore beds, one 60 miles to the north-east of El-Obeid, the other 50 miles to the north-west, in which iron is found in small fragments at a little depth in the sand. Round Lado, on the Bahr el-Jebel, the rocks are covered with a laterite soil containing iron ore. The ironstone and laterite which form the upper layer of rocks over a great portion of the Province of Bahr el-Ghazal are very rich in iron, and could probably supply the needs of the whole of the Sudan. In the Jur country round Mvolo where it has been smelted for many years, it is said to contain a percentage of 47 of pure iron.

*Lead.*—Lead has been discovered at Jebel Kutum, north of Kobe in Darfur; but is reported difficult to get. It is not uncommon for lead to occur in beds or nests within sandstone such as prevails here.

*Natron.*—Natron is found in the desert at Bir Natrun in the east of the Dongola Province. It is a mineral resembling in appearance a yellowish rock salt, and occurs in the cavities of basic igneous rocks. The purest is found in a seam from  $\frac{1}{2}$  to 2 in. thick just below the surface.

*Limestone and Marble.*—Deposits of limestone are very

common. The only limestone deposit in the Sudan sufficiently pure for water-softening purposes is at Summit to the south of Sinkat on the Atbara-Port Sudan line. The only marble in the Sudan is at Summit. At many other places in the Red Sea hills are masses of limestone schist, which are frequently almost a marble in the architectural sense.

*Gypsum and Alabaster.*—Pleistocene deposits exist on the maritime plain of the Red Sea about 40 miles to the north of Port Sudan. In places the gypsum is 30 ft. thick, but the smaller deposits are the best and purest.

*Salt.*—Many of the desert gravels are salt-bearing, particularly those of El-Butana. Salt is found in beds of considerable size in the Selima Oasis, and is produced at Karunga and at other places in Darfur, and at Ras Raweiyā on the Red Sea.

So far neither coal nor petroleum have been discovered in the Sudan, though there is a deposit of lignite of poor quality in the Dongola district. Attention is now being paid to the sedimentary deposits on the Red Sea coasts in the hope that they may prove oil-bearing. They are certainly a southwards extension of rocks similar to those near Suez at Jebel Zeit and Ras Jemsa where oil is now being produced.

## CHAPTER III

### FAUNA

General survey—Desert zone—Intermediate zone—Tropical zone—List of Sudan big game.

#### GENERAL SURVEY

THE great variations of climate, surface, and vegetation, creating conditions favourable to many different species, make the fauna of the Sudan peculiarly rich and interesting. It is the meeting place of Saharan, Abyssinian, and Central African types, and possesses an unusually large number of big-game animals and hundreds of varieties of birds. The chimpanzee, baboon, grivet, and colobus monkeys are found in its forests. The felines are represented by the lion, leopard, cheetah, serval, caracal, and Libyan cat ; and among other carnivora are two forms of hyaena (striped and spotted), wild dog, and jackal. Among the ungulata are the elephant, giraffe, zebra, wild ass, rhinoceros, buffalo, hippopotamus, ibex, wild sheep, and numerous kinds of antelope. These last, perhaps the most typical and widely distributed animals of the Sudan, range in size from the tiny dikdik to the magnificent giant eland and kudu, and in habitat from the Libyan desert to the tropical swamps, and include members of all four sub-families. The bird life, which is specially rich in water fowl, is best seen in the Nile valley, where many hundreds of species, both resident and migratory, congregate. Generally distributed residents include bustards, guinea fowl, several kinds of partridge, the spur-winged goose (*Plectropterus rueppelli*) and Egyptian goose (*Chenalopex aegyptiaca*), common and demoiselle cranes (*Grus grus* and *Grus virgo*), the black and white Egyptian vulture (*Neophron percnopterus*), the carrion-feeding marabou (*Leptoptilus crumeniferus*), and other storks, pelicans, plover, weaver-birds, shrikes, whydahs,



and glossy starlings. The Egyptian kite (*Milvus aegyptiacus*) is the most common scavenger, and is incredibly bold and destructive; it is found everywhere. The handsome red and black dura-bird (*Pyromelana franciscana*) ranging south from Dongola into Uganda is common and does much damage to crops. The brilliant little bee-eaters (*Melittophagus pusillus*) and sun birds (*Nectarinia metallica*) are seen throughout the Nile valley.

In winter vast flights of northern breeding duck scatter over the rivers. The most abundant of these is the pintail (*Dafila acuta*), whilst other visitors are the shoveller (*Spatula clypeata*), tufted duck (*Fuligula fuligula*), ferruginous duck (*Nyroca leucophthalma*), pochard (*Nyroca nyroca*), ruddy sheldrake (*Casarca rutila*), widgeon (*Mareca penelope*), and common and garganey teals (*Quercedula crecca* and *Q. circia*). Since the winter visitors also include many European song birds, and sea birds such as the blackheaded gull, tern, and cormorant, the birds of the temperate and tropical zones may here be studied side by side.

Common reptiles include the crocodile, which swarms in all the rivers, and various lizards, ranging from the big monitor (*Varanus niloticus*) four or five feet long, to the tiny sand lizards of the steppes. Though snakes are not numerous, there are eight poisonous species. The most deadly are the large puff adder (*Bitis arietans*) and the so-called spitting cobra (*Naja nigricollis*). This ejects venom into the face of any one approaching it, causing great pain and temporary blindness if the eyes are spattered. There are eleven species of scorpions, generally distributed; the largest (*Pandinus imperator*) ranging to 8 inches in length. The swamps and rivers swarm with coarse fish, some of considerable size; and good deep-sea fishing may be had off the coast, especially near Port Sudan.

The insect kingdom is represented with unnecessary fullness, and includes 44 distinct species of mosquito and 50 other blood-sucking flies. The vicinity of the rivers and swamps is infested with mosquitoes, several species of which

convey both malaria and filaria. South of lat.  $12^{\circ}$  N. the serut fly, a name given generally to the large blood-sucking *tabanidae*, makes life unbearable to men and beasts during the wet season. The tsetse, conveying several forms of animal trypanosomiasis, ranges south from about lat.  $10^{\circ}$  N. In the intermediate and tropical zones termites abound and are extremely destructive; and locust swarms often do great damage in the cultivated areas. Animal parasites of all kinds—including 21 species of ticks—flourish, and play a great part in the spread of disease.

The more valuable and interesting of the Sudan fauna are strictly protected by the Game Ordinances of 1903 and 1908, and the various additions since made to them. By these ordinances a sanctuary was created, bounded on the north by a line drawn from Kaka on the White Nile to Famaka on the Blue Nile, on the east by the Blue Nile from Famaka to the Abyssinian frontier and then by the boundary with Abyssinia to the Baro river, on the south by the Baro to its junction with the Sobat, and then by the Sobat to its junction with the White Nile, and on the west by the White Nile. This area is absolutely protected and shooting is only permitted to officials actually stationed within it. North of the sanctuary, a reserve has been made, bounded on the north by a line drawn from Jebelein on the White Nile to Karjok on the Blue Nile, on the east by the Blue Nile between Karjok and Famaka, on the south by a line drawn from Famaka to Kaka, and on the west by the White Nile. In this area only Sudan officials are allowed to shoot. The result of these provisions has been a great increase in game east of the Nile, in spite of the large amount destroyed by native hunters and by poachers on the Abyssinian frontier. In other parts of the Sudan game may only be shot under licence, and the number of head of the rarer species which may be killed is strictly limited. Equally stern restrictions and heavy taxes have been placed on the export of living specimens. The traffic in hides, trophies, and plumes is severely limited, and in some cases forbidden. The meat of many protected species

may not be bought or sold. The large carnivora are not protected, but there is a tax of ££1 each on the export of live lions, leopards, and cheetahs.

Sennar, Upper Nile, and Mongalla Provinces are the best game regions. Outside the sanctuary, the Dinder valley is now regarded as the finest district for sport, and, although regularly shot over, is well supplied with most of the larger species. The grass plains of east Mongalla Province also support vast herds of game. Though outbreaks of rinderpest and other diseases, some due to the overcrowding of the grazing grounds, cause great mortality from time to time, the rarer animals seem to be holding their own; and some—such as the giant eland, Mrs. Gray's waterbuck, ariel, and white rhinoceros—to be on the increase. Unfortunately the lion and leopard, more destructive than a cohort of sportsmen, have also benefited by the establishment of game-reserves, and are now far too numerous, especially in Kassala and Sennar Provinces. Since most of the ungulates, and especially the antelopes, are more or less migratory, ranging northwards in the rainy season, and moving from the inland steppes and savannahs to the river in periods of drought, information as to habitat is in most cases only approximate. Change of population, and new villages and clearings also quickly affect the distribution of the herds. Generally speaking, the increase of river-traffic has caused the game on the Nile to retire inland during the day, coming down to the water to drink at night. Water-loving animals, such as bush, reed, and water buck, are now only to be found in the more remote spots. The *mayas*, or moist alluvial depressions near the rivers, left after the subsidence of the floods, are always favourite grazing grounds, and sometimes become so crowded that contamination and disease result. For further details of game animals, see below, p. 144.

#### DESERT ZONE

North of lat. 16° N. the country is only suited to a Saharan and steppe fauna, living on scrub and desert grasses, and

able to tolerate a limited water supply. Even so, the most arid parts of the Libyan and Nubian deserts are almost devoid of animal life. Generally speaking, the fauna increases in interest and variety from west to east. West of the Nile, in the deserts of Halfa and Dongola Provinces, the rare addax and leucoryx antelopes, and the wild sheep, are the chief game animals. They give excellent sport but can seldom be approached by Europeans owing to the waterless character of their country. During 1913, no addax were shot on the annual hunting trip to the western desert, and only one leucoryx and one wild sheep were obtained. The creation of hill-sanctuaries for the wild sheep in west Dongola with a view to its increase has been suggested, this policy having successfully re-established the ibex in the Red Sea hills. South of lat. 20° N., the beautiful ril, or red-necked gazelle, exists in fair numbers, but seldom approaches the Nile. The Dorcas and Isabella gazelles are generally distributed throughout the desert zone. Jackals and hyaenas are common near all inhabited areas, and do much damage in Halfa province.

East of the Nile, though the greater part of Berber Province is now said to be almost denuded of wild life, some game animals survive in the Atbai, especially the north-east, where the Sudanese wild ass is found between Wadi Onib and Wadi Di-ib. The wild sheep, rare in this region, is known to exist in Jebel Rafit and east of the Wadi Gabgaba. The Red Sea mountains have a large and interesting fauna, most rich near Suakin, where the vicinity of the Abyssinian tableland begins to be felt. The cheetah, leopard, and lion have been shot in this district, though not of recent years. The wild ass is sometimes found, and has been known to invade the cultivated areas and attack the domesticated donkeys. The characteristic animal of the region is the Nubian ibex, now confined to the Red Sea range. It has sanctuaries upon several of the hills, and appears to be holding its own, especially in the Aliab country. The antelopes include the great kudu, oryx, and Abyssinian oribi. The ariel, klipspringer, and

dikdik are all found in the coastal hills south of Jebel Bawati (c. lat. 20° N.). The rare and local beisa inhabits a patch of barren ground near lat. 18° N. The hare is the most important small game.

The birds of the desert zone, mostly identical with those of Upper Egypt, are found principally in the Nile valley. Beyond generally distributed species already mentioned, the most characteristic game birds are two common forms of sand grouse (*Pterocles exustus* and *P. senegalensis*) which come down to the river in early morning in large flights. *Pterocles lichtensteini*, which is smaller, inhabits the rocky hills of the Atbai. In the Red Sea range, the brown desert partridge (*Ammoperdix cholmleyi*) is found in rocks near water. The handsome partridge *Francolinus erckeli*, as large as a hen pheasant, is confined to the neighbourhood of Erkowit. The bustard and quail are common.

On the Nile, pelicans, storks, cranes, herons, and spoonbills abound. The black-headed Egyptian plover or crocodile-bird (*Pluvianus aegyptius*), popularly credited with the habit of feeding out of the open mouths of crocodiles, is plentiful. Birds of prey include the Egyptian vulture, Egyptian kite, and dusky raven (*Corvus umbrinus*). Amongst smaller birds, the destructive yellow sparrow (*Passer luteus*) ranges north of Berber.

Fish appear to be less abundant in this reach of the Nile than farther south. On the coast, especially near Port Sudan, deep-sea fish are plentiful and give excellent sport from November to March. At this season the harbours swarm with sardines, which are the staple diet of the larger fish and bring them in shore. The principal kinds caught near Port Sudan are the *bayado*, a powerful fish ranging from 3 to 40 lb. or more in weight, and very abundant; the *barracouta* which is built on the lines of the salmon and is extremely sporting (5 to 15 lb. in weight); the *sirwee*, not unlike a mackerel, and generally moving in shoals (maximum weight about 6 lb.); and the *bahara*, which lie in deep water, and can usually only be caught after dark (maximum weight, about 16 lb.). Sharks are numerous off the coast.

Reptiles include several harmless sand snakes, the spitting cobra, the horned asp (*Cerastes cornutus*) which hides in the warm sand, and the small and widely distributed viper, *Echis carinatus*, the bite of which is much feared by the natives. Sand lizards are numerous. Insect pests are less insistent than farther south. They include, however, the small but maddening sand fly called nimetta (*Simulium griseicollis*) which swarms from November till April in the Nile Bend between Dalgo and Korti and sometimes compels the temporary emigration of the inhabitants. Its equally unpleasant relative, the felicitously named *Simulium damnosum*, is most common near Abu Hamed, where its presence may in bad years make outdoor work impossible. The whole valley between the third cataract and Khartoum is liable to these pests, and their favourite haunts are usually thinly populated. Locusts visit all the cultivated areas, and often do much damage in the Tokar plain. Termites are numerous and destructive.

Several species of serut fly (*Tabanus mordax*, *T. kongi*, and *T. camellarius*) occur at Khor Arbat, 22 miles north-north-west of Port Sudan. A serut is also said to be the conveyer of *Trypanosoma evansi*, infecting the camels at Erkowit. With these exceptions the serut does not seem to extend into the desert zone.

#### INTERMEDIATE ZONE

The transitional region lying between lat. 11° and 16° N. contains a considerable variety of animal types, ranging from the steppe fauna of Kordofan and northern Darfur to the Abyssinian species which flourish in the richer vegetation and well watered country and higher rainfall of the eastern frontier.

Kordofan and Nuba Mountains, once rich in game, have now become so denuded, chiefly by native hunters and trappers, that a reduction in the number of licences to sportsmen shooting these districts has become necessary. The general northward movement of the larger animals from the

wet southern plains into Dar Homr during the rainy season is the signal for a massacre on the part of the Homr Arabs ; so too in the north the southward migration of the *oryx leucoryx* during the dry months is followed by bands of hunters, and the surviving herds of this characteristic Kordofan antelope are now rapidly retreating to the north and west. The larger tiang (*Damaliscus korrigum jonesi*), ranging sandy country just north and south of lat.  $14^{\circ}$  N., is sometimes found in its company. The addax sometimes occurs in the extreme north of the province, and the great kudu is or was to be found in the less accessible rocky hills of the Nuba mountains. The chief gazelles of Kordofan are the beautiful addra or ril, widely distributed north of lat.  $13^{\circ}$  N., the red-fronted gazelle, now becoming rare in this province, and the Dorcas. Giraffe are said to range the sandy country on the Darfur border, west and north-west of El-Obeid. Among carnivora, lions and leopards in small numbers range north as far as lat.  $15^{\circ}$  N. ; the serval, caracal, and Libyan cat, civet, and white-tailed and banded mongoose are all found. Striped hyaenas are plentiful and destructive, and the wild dog (*Lycaon pictus*) seems to extend into the wadis of the steppe country as far as lat.  $15^{\circ}$  N. The common jackal of Kordofan is *Canis anthus sudanicus*. Two foxes (*Vulpes famelica* and *V. pallida*) inhabit the northern desert ; the first living in the rocky hills in solitary holes, the second in gregarious sand burrows. There are at least two species of hare, one being the sand-coloured *Lepus isabellinus* ; and on the northern steppes numerous desert mice, gerbils, and jerboas (*Leggada*, *Gerbillus*, *Dipodillus*, *Jaculus*, &c.). Lizards of several kinds are found in the desert, also burrowing sand snakes (*Eryx jaculus* and *E. muelleri*). The chief poisonous species are the *Echis carinatus* and horned asp, found in the sandy northern region, and the spitting cobra, which is generally distributed.

The resident fauna of the Nile valley between Khartoum and Jebel Ahmed Agha has greatly diminished since the opening up of the Sudan. The big game has mostly retreated

into the interior, and, except in dry seasons, only approaches the river at night. In Khartoum and Blue Nile provinces little remains but the commoner gazelles, mainly Isabella and Dorcas. The grivet monkey becomes fairly plentiful south of El-Dueim. In the south Gezira, Abyssinian elephants are still found, and have lately much increased in the officers' reserve. In this protected area lions, leopards, buffalo, giraffe, tora, tiang, roan, kudu, oribi, waterbuck, reedbuck, and bushbuck all flourish, mainly keeping well to the south and east. The white-eared cob is found in the extrême south of the district. Large game from the south, including giraffe, kudu, and hartebeests, travel as far north as Jebelein during the rains. Among smaller mammals, wart-hogs, honey badgers and conies are common in the hills east of Jebelein; and bats of various kinds abound. River turtles (*Trionyx triunguis*) are common. Crocodiles and hippopotami, though seen as far north as Abu Zeid, only become plentiful south of lat. 13° N.

The district east of the Blue Nile, embracing all Kassala and most of Sennar province, is now, from the point of view of the zoologist, one of the richest in the Sudan. The valleys of the Upper Atbara, Setit, Blue Nile, Rahad, and Dinder are inhabited by an Abyssinian fauna which, though much preyed upon by native hunters and by elephant-poachers from Abyssinia, holds its own, and is increasing in some localities. On the Upper Atbara, troops of baboons (*Papio anubis*) and grivet monkeys (*Cercopithecus sabaeus*) inhabit the forest. The Abyssinian elephant ranges the whole district, especially in the early part of the cool weather, ascending in the rains as far north as the Gash. It is scarce on the Rahad. The lion and leopard seem to be increasing, particularly near Kassala and on the Rahad and Dinder; and all the lesser Sudan carnivora occur here. The hyaena and wild dog are plentiful and do much damage. Buffalo are said to be abundant on the Upper Dinder and Blue Nile. They are scarce on the Rahad, and do not seem to ascend much north of lat. 13° N. Giraffe range the uninhabited country on both sides of the Dinder. Among antelopes, the rare and splendid kudu is fairly



numerous in rocky ground on the Setit, and more plentiful on the Blue Nile above Suleil. The roan is distributed in the same localities. In 1913 the stock both of this species and the tiang was said to be good. Tora and waterbuck (*Defassa*), very common on the Setit and Atbara, were at this date less numerous on the Blue Nile system, but reedbuck and ariel swarmed on the Upper Rahad and Dinder. The Abyssinian oribi is found on the upper courses of all the rivers. The rare little beira lives in the hills above Roseires, and the Abyssinian duiker on the Blue Nile above Suleil. The dikdik does not seem to come south of the Atbara. Heuglin's gazelle, though not numerous, is found near Kassala and on the Atbara and Setit, generally near water. The wart-hog, not very common, occurs in the wooded regions. The rhinoceros, found only on the Upper Dinder, is extremely rare. The hippopotamus is still seen in fair numbers on the Blue Nile, but not on the Rahad. Crocodiles and river-turtles are plentiful. Among snakes, pythons—often of considerable size—are met with, and the puff-adder (*Bitis arietans*) and spitting cobra occur throughout this district.

Those parts of the White and Blue Nile valleys which fall within the intermediate zone are specially rich in bird life. The avifauna of the Blue Nile is Abyssinian in type. On the White Nile most of the northern species extend south of Khartoum, whilst tropical types become more numerous as the river is ascended. It must not, therefore, be assumed that species described under this zone are restricted to it, or that those mentioned represent more than a small proportion of the whole. The great mud flats formed opposite Omdurman by the confluence of the White and Blue Nile are uncovered when the river is low, and are then haunted by myriads of water fowl. Black-headed gulls and terns resort here in thousands. In winter there are huge flocks of white and gape-billed storks (*Ciconia ciconia*, and *Anastomus lamelligerus*), Nile geese and spur-winged geese, spoon-bills, pelicans, common and demoiselle cranes, wood ibis (*Pseudotantalus ibis*), avocets, stilts, curlew, plover, common teal, ruddy sheldrake, widgeon,

pintail, whimbrel, and skimmers. The carrion-feeding marabout stork, sacred ibis (*Ibis aethiopica*), goliath heron (*Ardea goliath*), crowned crane (*Balearica pavonina*), and vociferous sea-eagle (*Haliaetus vocifer*) are conspicuous resident species ranging south from Khartoum. On the Lower Blue Nile the huge flocks of European cranes and sacred ibis are specially noticeable. Among smaller birds, the buff-fronted dioch (*Quelea aethiopica*) is seen in vast flocks, often numbering hundreds of thousands, in Kassala, Sennar, and Kordofan. Even more plentiful are the weaver birds: Reichenbach's weaver (*Hyphantornis taeniopterus*) sweeps over the Nile valley south of Khartoum in flocks which look like drifting clouds of smoke, are heard like the roaring of a hurricane, and are said by some observers to number a million or more. The golden weaver (*Xanthopilus galbula*) is almost equally abundant on the Blue Nile and the coast. All three species are very destructive to crops, feeding voraciously on ripening grain. The yellow sparrow, extending south to lat. 12° N., the silver-bill (*Uroloncha cantans*) ranging from Roseires to Darfur, and the many species of sparrow, wax-bill, and fire-finch, are all more or less harmful to agriculture. The paradise whydah (*Vidua paradisea*) extending from the Setit and Blue Nile to El-Obeid, and the beautiful golden-breasted and rock buntings also occur in this zone. Below Dueim, wading birds are chiefly seen in the shallow lagoons, and the river banks are mainly tenanted by herons, night-herons, pelicans, and fishing-eagles. Small migrants wintering in this region include the lesser white-throat, reed, marsh, and pallid warblers, and the red-throated pipit. The little Nile shrike (*Nilaus afer*), bulbul (*Pycnonotus arsinoe*) and babbler (*Crateropus leucocephalus*) are common, and green parrakeets become numerous south of lat. 13° N. Among game-birds, Clapperton's partridge (*Francolinus clappertoni*) is peculiar to the Blue Nile. On the White Nile it is replaced by *F. gedgii*, which lacks the pale edge to the tail feathers. Guinea fowl are plentiful near the river. The little stone-pheasant (*Ptilopachys fuscus*) is met in small parties among the rocky hills of Kordofan and the Abyssinian frontier ;

and a tiny quail (*Ortyxelos meiffreni*) with the flight of a lark, lives among the heskenit grass in Kordofan. Two bustards (*Otis nuba* and the small *Lissotis senegalensis*) are also peculiar to this province. The ostrich, generally distributed in the dry regions, was at one time specially characteristic of Kordofan, where it was caught and kept in captivity in large numbers. It now seems to be rare. Its capture is only permitted for purposes of ostrich farming, whilst its destruction is absolutely prohibited.

Among the insect pests, first place must be given to the serut fly; a name applied indiscriminately to several large varieties of *Tabanus*, of which *T. taeniola* is perhaps the worst. These creatures breed in the moist bush and forest near the rivers, and appear in May and June. They are about an inch long, and inflict a maddening sting which often produces slight fever in their human victims. Animals, especially camels, rapidly lose condition under their persistent attacks, and finally die. The serut descends the Nile as far north as Dueim, though not plentiful below Jebelein. There can be little doubt that it is the cause of the northward migration of game animals which has been observed in the Nile valley during the rainy season. It makes the grasslands south of Kassala useless for open grazing during and just after the rains, and is specially bad at this period round Gedaref and Gallabat; camels must leave the district at the end of May and other cattle be put under cover. Its northern limit east of the Nile appears to be Sennar. The chief feeding time of the serut is the late afternoon; it generally leaves off just in time for the mosquito to begin. Mosquitoes, which are unevenly distributed in this region, include several anophelines. The most mischievous species is *Culex fatigans*. On the White Nile mosquitoes occur wherever the banks are swampy; but their worst depredations may be escaped by camping a short distance inland on the higher ground. They are very bad on the Blue Nile above Wad Medani, between August and October. In the towns, vigorous preventive measures have much diminished the mosquito pest. For a fuller dis-

cussion of both the serut and mosquito, see 'Health Conditions'. Two other insect pests of the Blue Nile region are the *Stomoxys*, a small black fly which is numerous in August and attacks horses and donkeys with vexatious but not fatal results; and a blood-sucker closely related to the serut, called *Pangonia magretti*, which is said to convey camel-sickness and to be the cause of the migration of camel-breeding Arabs from the Rufaa district. This fly also occurs in central Kordofan. In some years locusts do great damage to the crops in the intermediate zone. Near Khartoum the commonest resident species is *Paecilocerca hieroglyphica*, which haunts the ushar plants. Visiting swarms are usually either the yellow *Schistocerca peregrina* or the brownish red *Acridium aegyptium*.

#### TROPICAL ZONE

The tropical zone, extending from lat. 11° N. to the frontiers of Belgian Congo and Uganda, and including the great swamp and wet savannah regions of the Bahr el-Ghazal, Sobat-Pibor and Mongalla provinces, and the river valleys and upland forests of the ironstone belt, is rich in big game. The distribution of the fauna is, nevertheless, extremely uneven. There are large areas of forest unsuited to antelope, swamps where giraffe cannot live, treeless and dry regions which will not support elephant. In the Nile valley, and especially on the west bank, the game has been much reduced, and most of the shy species have retreated some distance inland. Moreover, the whole district is the scene of great periodic animal migrations, occasioned partly by the sharply contrasted wet and dry seasons, and widespread annual floods, partly by the depredations of the serut fly, which in late spring drives the game north down the Nile valley in search of peace. Generally, during the rains, the game moves to higher ground, the elephant from swamp to savannah, the giraffe from savannah to steppe. In the dry months, when the grass upon the back lands withers, the return movement towards marshes and rivers takes place.

The fauna of the wooded plains forming the south fringe of

Kordofan and Nuba Mountain Provinces, and of the northern part of Bahr el-Ghazal Province, are practically identical and may be taken together. In the wooded parts, baboons, and red hussar and grivet monkeys (*Cercopithecus pyrrhonotus*, and *C. aethiops*) are fairly common. A beautiful little nocturnal lemur (*Galago teng*) with soft grey fur is found in the thick thorn bush. Lions and leopards, especially the latter, are still fairly abundant, particularly near the Bahr el-Arab. The cheetah, though rarer, is sometimes seen in the open grasslands. Among smaller carnivora are the spotted hyaena and wild dog, which seem to be increasing and are very destructive, the serval, caracal, jackal, and civet. Elephant range the whole region, especially the swamp belt, though native hunters have considerably reduced their numbers in the west. The ivory runs large. On the Bahr el-Arab the elephant are specially numerous, moving north during the rains, but keeping east of long.  $28^{\circ}$  E. West of this meridian the country on the border of Darfur is too sandy for them; but it suits the giraffe, which extends from about long.  $30^{\circ} 30'$  E. westwards, and ranges the savannahs of north Bahr el-Ghazal during the dry season. Hippopotami are common on all the chief rivers; and so numerous on the Bahr el-Ghazal as to constitute an obstruction to navigation. The black rhinoceros, though scarce, is sometimes seen. Buffalo are generally distributed in the neighbourhood of the rivers. Many fine species of antelope are represented. The tiang and Heuglin's hartebeest appear to be fairly plentiful in the open country. The roan is said still to be found in the south of Nuba Mountains Province, near Lake Abiad. The oribi is generally distributed. In marshy grasslands near the rivers, the water-loving species, bushbuck, Bohar reedbuck, and waterbuck, are widely spread. The beautiful Mrs. Gray's waterbuck (*Cobus maria*) is found in the swamps of the Bahr el-Ghazal and Jur. The rare and shy sitatunga lives in the papyrus jungle of the same regions. Smaller mammals include the hare, the great cane rat (*Thryonomys swinderemianus*), the rare and curious burrowing mole-rat (*Georychus*) and many smaller rats and gerbils. Ground

squirrels (*Xerus*) are plentiful ; tree squirrels (*Funisciurus*) less so. Bats, both fruit-eating and insect-eating, abound. Edentata are represented by the ant-bear (*Orycteropus aethiopicus*) and scaly ant-eater (*Manis tricuspis*) ; both are nocturnal and seldom seen.

Farther south, on the terraces and upper river valleys of the ironstone region, the fauna becomes more varied. The chimpanzee (*Anthropopithecus troglodytes schweinfurthi*) and the beautiful black and white Colobus monkey (*Colobus guereza*) are found in the forests of the Nyam Nyam country. The magnificent giant eland is widely distributed between the Sopo and the Rohl, feeding in the valleys in the dry season and ascending to the drier slopes in the rains. Elephant are specially abundant between the Pongo and the Sueh ; and the Sopo valley is described as a paradise of wild life. South of Dem Zubeir, elephant, roan, waterbuck, and dikdik, are all common. The Uganda cob is plentiful in many places, but Vaughan's cob appears to be the dominant species on the Rohl. The blue duiker, though not common, is found in the forests of the ironstone plateau. The wart-hog is common ; the bush-pig scarce and local.

The district formerly known as the Lado enclave contained little beside elephants, lions, and leopards when it reverted to the control of the Sudan Government ; but a few years' protection have sufficed to re-establish all the more interesting species. In the more open parts water, reed, and bushbuck, oribi, blue duiker, white-eared cob, and hartebeest are abundant. A special light-coated variety of Uganda cob was shot here by Colonel Roosevelt in 1909. Giraffe are numerous in the dry season, descending the Nile valley towards Jebelein in the rains. The Lado, however, is chiefly celebrated as the habitat of the great square-mouthed, or white rhinoceros, one of the rarest and largest of land animals. Being now strictly protected, its range has increased, and extends north to Shambe and south to Wadelai. The black rhinoceros is also sometimes, though more rarely, found on these reaches of the Bahr el-Jebel.

East of the Nile, the game is more abundant and widely distributed than on the west ; the large area which has been converted into a sanctuary, and the wild and inaccessible character of the backlands in Sobat-Pibor and Mongalla Provinces, favouring its preservation. Most of the larger fauna have retreated to this inland region, avoiding the neighbourhood of the Nile, and are seldom seen by passing voyagers. In the sanctuary, elephant are said to be increasing, in spite of wholesale slaughter on the part of Nuer and Abyssinian poachers. Most of the species enumerated for Bahr el-Ghazal Province are abundant. The white-eared cob and Mrs. Gray's waterbuck are found in the swamps. The Khor Yabus, which has surface water throughout the year, ensures the presence of game in the district at all seasons, and is a gathering-point for many kinds of animals. Bands of Nuer armed with rifles now vigorously hunt the Sobat valley, poaching ivory, which they exchange into Abyssinia for guns and cattle. The reed and waterbuck are also mercilessly pursued with dogs and spears, and followed in canoes when they take to the water. These practices have much reduced the head of game on the Sobat : but on the Pibor and its tributaries elephant, giraffe, tiang, topi, hartebeest, reed and waterbuck, and other antelopes and gazelles are plentiful. The forest between the Baro and the Gila is full of elephant in the dry season, when it is a favourite resort of the Abyssinian poachers. Chimpanzees are found in the wooded districts. The marshy savannahs bordering the Bahr el-Zeraf are ranged by giraffe in the dry season, and lions are frequently met. Further south and east, game becomes yet more plentiful. The zebra is found on both banks of the Bahr el-Jebel, ranging southwards from Bor. The region south and east of Gondokoro is rich in all the great fauna. Observers speak of great herds of elephant seen near Mount Belinian, moving like an army corps through the bush, and of numbers of giant eland at Jebel Lafon. Rothschild's gazelle is, in the Sudan, peculiar to this reach of the Bahr el-Jebel. In dry seasons vast numbers of animals come down to the river near Mongalla to drink,

sometimes making a track several yards wide, worn bare by feet of every size from the elephant to the duiker.

Little is known as yet of the vast quantities of game which must be sheltered by the mountain valleys on the Uganda border. In the Kideppo, however, the lion, leopard, cheetah, elephant, giraffe, buffalo, eland, roan, topi, Jackson's hartebeest, lesser kudu, Grant's gazelle, water, bush, and reedbucks, oribi, duiker, and dikdik have been found. It is probable that the herds which graze the savannahs of south-east Mongalla retreat to these valleys in the rains. This region is still practically virgin soil to the European hunter and zoologist.

As regards bird life, many of the species seen in the intermediate zone extend south, the majority of these being also native to Uganda. The bustard, guinea fowl, and stone pheasant are all found. Among resident birds of prey on the Bahr el-Jebel are the handsome Bateleur eagle (*Helotarsus ecaudatus*), vociferous fish eagle, and brown vulture (*Necrosyrtes monachus*). The beautiful saddle-backed stork (*Ephippiorhynchus senegalensis*) is still fairly common. Kites, owls, and parrots abound. In the swamp districts black, open-billed, and marabou storks, white, grey, and Goliath herons, ibis, pelicans, spoonbills, geese, and duck are plentiful. The small white cow heron is seen in all the pastoral districts, perching on the cattle and following the herds. In wilder regions it attends on the buffalo. The egret, owing to its persistent slaughter in Abyssinia, is migrating into the south-eastern Sudan, but is not plentiful. The purple heron (*Ardea purpurea*) is found in the papyrus. Among the numerous waders, the whistling teal (*Dendrocygna vidua*) is specially common, and flocks in thousands on Lakes No and Ambadi. The beautiful pygmy goose, or cotton teal (*Nettion auritus*), though nowhere common, is indigenous on the upper Nile, and in the rains is found on the inland fulas of southern Kordofan. The ostrich is rare and does not extend south of Gondokoro. Three species of partridge are met with : Gedge's francolin in the northern part of Bahr el-Ghazal Province,



Heuglin's francolin (*Francolinus icterorhyncus*) with yellow legs and feet, in the ironstone region, and Grant's francolin (*F. granti*) which is about half the size of the others, in Mongalla Province. The pretty Harlequin quail (*Coturnix delagorguei*) is common during the rains. Three birds of great interest, the destruction or capture of which is absolutely prohibited, are found in this zone, ranging southwards into Uganda. The first is the whale-headed stork, or shoe-bill (*Balaeniceps rex*) found in the swamps and backwaters of the Bahr el-Ghazal, and most frequent near Lakes No and Ambadi. It is very shy and of solitary habit. The secretary bird (*Serpentarius secretarius*) is now very rare, but sometimes seen in Mongalla Province. Finally, the large black ground-hornbill (*Bucorax caffer*) is fairly plentiful among the shorter grass near Wau and Rumbek. The sale or purchase of the plumage of these birds is forbidden throughout the Sudan. Living specimens of the shoebill exported under permit pay a tax of £E5, and of the secretary bird, £E2. Among small birds the handsome plantain-eaters, the brilliantly coloured bee-eaters, sun-birds, rollers, and fly-catchers are plentiful. The yellow mantled whydah (*Coliuspasser macrurus*) and Heuglin's fantailed whydah (*Urobrachya phaenicea*) are found near water on the savannahs of the ironstone country, and the black-billed sparrow-weaver (*Ploceipasser superciliosus*) south of the Sobat.

Among poisonous reptiles the green viper (*Causus resimus*), about 18 ins. long, and venomous grey cobra (*Naja hajae*), ranging to 5 ft., are common on the Sobat and Upper White Nile; the spitting cobra and puff adder range south to Gondokoro. Large pythons occur. The warana lizard is common on the Bahr el-Jebel, where it attains a considerable size. Fish are common in all the rivers and the sudd lagoons. The Nile salmon (*Salmonica edax*) gives excellent sport from September to May, and is said to be good eating.

It is in the southern zone, and especially in the sudd region, that insect pests attain their fullest development. The swamps of Bahr el-Ghazal Province are a vast nursery of

mosquitoes, which range in size from the tiny anopheles to the large scarlet sudd mosquito, and include several carriers of malaria. They make the whole neighbourhood of the rivers and wet savannahs almost uninhabitable during the wet months, though few are seen except close to the water in the dry season. Camps in this region should always be made on the higher ground at a distance from the rivers, and watered where possible from wells. These, being mostly shallow and frequently disturbed, are not such favourable breeding places for mosquito-larvae as the lagoons. The early evening is the favourite feeding time. Myriads of may flies, midges, moths, and fire-flies make the use of any artificial light almost impossible at dusk. During the wet months the serut is second only in importance to the mosquito and is responsible for much mortality among transport animals. It is specially bad near Wau, but infests the whole Nile valley. Some of the species and especially the redoubtable *Tabanus taeniola* will follow animals for several miles, only desisting from their attacks when fully gorged. The large and brightly coloured *T. africanus*, a vicious biter, is the suspected agent of cattle disease. In the ironstone country the principal scourge is the tsetse fly. The nomenclature of the endemic species is still unsettled; but either the deadly *Glossina palpalis* or a kindred species, *G. fuscipes*, conveying sleeping sickness, is distributed in the river-valley of the Nile-Congo watershed, between Dem Zubeir and the Yei. It is found wherever the combination of open water and deep shade provides suitable conditions, but never in the sudd area, as the shade of the papyrus jungle is insufficient, and it seems to require dry ground. In size and general appearance it resembles the house fly, but the wings when folded cross and project beyond the abdomen. *Glossina morsitans*, transmitting animal trypanosomiasis, is locally distributed south of lat. 10° N. It is common over the greater part of the Bahr el-Ghazal and west Mongalla Provinces. It appears less dependent on open water than *G. palpalis*, and is seldom found in its company. Its normal northern limit in the west seems to be a line passing through Hofrat el-Nahas,

Kafia-Kingi, Kossinga, Chak Chak, and Wau. East of the Nile it infests the Sobat valley. The Nuba are said to have introduced it artificially into Nuba Mountains and south Kordofan, as a protection against their enemies the Baqqara, who are obliged to withdraw with their flocks from any district where it prevails. The worst ravages of *Glossina morsitans* are among transport animals—horses, mules, and donkeys—the mortality amongst which is high. Its feeding times are from dawn to 11 a.m. and from 4 p.m. till dusk. It bites freely in dull and rainy weather, and cannot be driven off till gorged with blood. It is numerous near the rivers, especially in the big-game areas, but is also often found several miles from water. Both forms of tsetse are most prevalent during the rains. (For further details, see 'Health Conditions'.)

Termites abound throughout the southern zone, where their mounds are one of the most characteristic features of the landscape. In the Lado, and possibly elsewhere, both the red and black varieties of the much-dreaded carnivorous driver-ants (*Dorylus*) are found. Their columns kill every living thing in their path, and may compel the abandonment of any camp which they invade, unless promptly checked by a barrier of salt or hot embers. Wild bees are common in the Bahr el-Ghazal Province, where their honey is regularly collected by the natives. They are formidable if their nests are disturbed, not infrequently stinging men and transport animals to death.

Among dangerous parasites of the tropical zone are the bilharzia worm and ankylostome or hookworm (see 'Health Conditions').

#### LIST OF SUDAN BIG GAME<sup>1</sup>

##### *Carnivora*

*Lion*.—The lion (Sudanese *asad*) is still plentiful in suitable country, but seldom seen north of Kassala, though occasionally reported in the rocky hills south of Suakin. It is most numerous in the Kassala, Sennar, Sobat-Pibor, and Mongalla Provinces, and is said to be increasing on the Rahad. It ranges the ironstone region of the Bahr el-Ghazal, the White Nile valley,

<sup>1</sup> See also Appendix IV.

Lado, and hills of the Uganda frontier. In Kordofan it has been seen as far north as lat. 15° N., and till recent times was tolerably plentiful south of the Nuba Mountains.

Unprotected. Export tax on living specimen £E.1.

*Leopard*.—The leopard (Sudanese *nimr*) is commoner than the lion, and still more widely distributed. In the north, the leopard of upper Egypt, with small spots on a bright tawny ground, is sometimes though rarely seen in Halfa and Red Sea Provinces. In the south, the Nile leopard, with few and widely spaced spots, often ringed or ocellated, is common in Bahr el-Ghazal and Mongalla. The leopard is rarely found on the Blue Nile and Dinder, but more frequently on the Atbara.

Unprotected. Export tax on living specimens £E.1.

*Cheetah*.—The cheetah (Sudanese *fahad*) is a rare animal in the Sudan; it is distributed in the wadis of the intermediate zone, and in the lowlands and open savannahs of the Nile valley northward to Kordofan.

Unprotected. Export tax on living specimens £E.1.

### *Ungulata*

*Elephant*.—Two distinct races of elephant (Sudanese *fil*) are found in the Sudan. The Abyssinian type (*Elephas africanus oxyotis*) is found in the east, chiefly on the Blue Nile and its tributaries. It is of great size, the huge ears forming an elongated triangle sometimes 6 ft. in vertical diameter. The tusks are comparatively small, but give fine ivory. This race is most common on the Setit, ranging in the rainy season as far north as the Gash, and on the upper Blue Nile, Dinder, and Rahad. Though much harried by native poachers, its numbers in the reserve and sanctuary have recently much increased. It extends into the Gezira. The west Sudan type (*Elephas africanus rothschildi*) is also large, and has tusks frequently weighing 130 lb. The ivory is coarse. The celebrated Jumbo belonged to this race. It is widely distributed in the Bahr el-Ghazal and Mongalla Provinces, and is very numerous on the Bahr el-Arab, moving north during the rains into Dar Homr, between long. 28° and 30° E. West of this, the country is too sandy for it.

Two elephants may be shot by holders of an A licence. Export tax on living specimens £E.24.

*Black Rhinoceros*.—Shoulder height about 5 ft. Length up to 11 ft. Anterior horn up to 43 in., but usually much less in the Sudan. The black rhinoceros (*Rhinoceros bicornis*, Sudanese *anaza*) is found chiefly in the south of Bahr el-Ghazal and Mongalla Provinces, but is everywhere scarce. A few are still said to exist on the Setit and the Blue Nile and its tributaries.

Absolutely protected in Kassala and Sennar Provinces. Elsewhere, one may be shot by holders of an A licence. Export tax on living specimens £E.24. Sale or purchase of hides, horns, flesh, and trophies forbidden in Kassala and Sennar Provinces.

*White or Square-mouthed Rhinoceros*.—Height about 6 ft. 6 in. Length 13 ft. 9 in. Anterior horn about 56 in. long. The white rhinoceros (*Rhinoceros simus cottoni*, Sudanese *khartyt*), the third largest land animal in the world, is found on the Bahr el-Jebel, chiefly in the Lado, where it is the dominant species. Usually found in grass lands near the river, but retreats two days' journey inland. Ranges north to Shambe, south to Wadelai, west into French Congo.

Its destruction or capture, and all traffic in hides, horns, and trophies, are absolutely prohibited.

*Grant's Zebra*.—Grant's zebra (*Equus burchelli granti*, Sudanese *homr el-khala*) is very rare, but occurs on both banks of the Bahr el-Jebel northward to Bor.

Its destruction or capture, and all traffic in hides, horns, and trophies, are absolutely prohibited. Tax on living specimens exported under permit £E.10.

*Wild Ass*.—The wild ass (*Equus asinus*) has now a very restricted range, being chiefly found in the hills of the Atbai between the Onib and Di-ib. It occurs in the rocky hills of Halfa, Berber, Dongola, and Red Sea Provinces, ranging south to Suakin. The Sudan race, unlike the Somali wild ass, has no stripes on the legs. It has been much reduced by the Arabs, who hunted and captured the foals. It has immense speed, and no animal is more difficult to approach.

Its destruction or capture, and all traffic in hides and trophies, are absolutely prohibited.

*Buffalo*.—Shoulder height 4½–5 ft. Horns up to 36 in. on the curve. Spread 30 to 40 in. The Sudan buffalo (*Bos caffer equinoctialis*, Sudanese *gamus*, Dinka *anyarr*) is the northern type, with short horn-tips. It is widely distributed in the moist regions, principally the reed-beds fringing the Bahr el-Ghazal and their grassy back lands, the Bahr el-Arab, Setit, Blue Nile, and Dinder. It is not found on the Atbara, but ranges north on both banks of the Nile to lat. 11° N., and south to the Uganda frontier.

Three buffalo may be shot by holders of an A licence. Export tax on living specimens £E.10.

*Ibex*.—Height 39 in. Horns 33–43 in., scimitar shaped. The Nubian ibex (*Capra nubiana*, Sudanese *beden*) lives in the rocky hills of Red Sea Province, where it appears to be holding its own. Sanctuaries have been created for it on Asotriba, Erba, Arbat, and Karbush hills, where it has absolute protection. It is shy, and hard to shoot.

Four may be shot by holders of an A or B licence, but not more than two of these south of Suakin. Export tax on living specimens £E.5. Traffic in hides, horns, and trophies prohibited.

*Wild Sheep*.—Shoulder height 36 in. Horns up to 28 in. The wild sheep (*Ovis lervia*) is found in the rocky hills of the Libyan desert and north Kordofan. It is rare, and hard to approach on account of its desolate and waterless habitat. Scarce east of the Nile, but reported from Jebel Rafit and the hills east of Wad Gabgaba.

Two may be shot by holders of an A or B licence. Export tax on living specimens £E.5.

*Tora Hartebeest*.—Shoulder height 44 in. Horns 12 to 20 in. This Abyssinian species (*Bubalis tora*, Arabic *teitel*) is common on the Setit, upper Atbara, Blue Nile and its tributaries, but does not appear to extend beyond this region. Usually found in large herds. Swift and very strong. Is believed to inter-breed with *Bubalis lehwel niedecki* in the Nile valley.

Four may be shot by holders of an A licence. Export tax on living specimens £E.10. Traffic in hides, horns, and trophies prohibited.

*Heuglin's Hartebeest*.—Height about 52 in. Horns 20–25 in. This antelope (*Bubalis lehwel typica*, Arabic *teitel*) is often known as Jackson's hartebeest, but is a distinct Sudan species. The type form is found west of the Nile, from lat. 10° N. southwards, and is locally numerous. Another race, *B. l. roosevelti*, without black markings on the leg, replaces it east of the Nile and south of the Sobat. A third race, *B. l. niedecki*, inhabits the right bank of the White Nile. All prefer open grass land or light bush, and form herds of 5 to 50 head, one out of ten mounting guard on a termite hill.

Twelve may be shot by holders of an A licence, but not more than four of these outside Bahr el-Ghazal Province. Export tax on living specimens £E.10. Traffic in hides, horns, and trophies prohibited.

*Tiang*.—Shoulder height about 45 in. Horns 18–22 in. The tiang (*Damaliscus korrigum tiang*, Arabic *teitel*) is numerous in the moist grass lands south of lat. 12° N., especially in Upper Nile and Mongalla Provinces. It is also plentiful on the upper Dinder and south Gezira, but is not found on the Setit, Atbara, or Rahad. A variety (*D. k. jonesi*) is said to inhabit the sandy regions of western Kordofan, consorting with the addra and oryx. It is plumper and browner than the type form.

Six tiang may be shot by holders of an A or B licence.

*Topi*.—Shoulder height 50 in. Horns up to 20 in. The topi (*Damaliscus korrigum jimela*) differs little from the tiang. It is a Uganda species, found in the Kideppo valley and open country on the Uganda border, and often consorting with hartebeest.

It is not mentioned in the schedules of the Game Ordinance.

*Bush Duiker*.—Shoulder height about 25 in. The common bush duiker (*Cephalophus grimmii*) is widely distributed in the south and east. Two distinct races are represented, the Abyssinian in the east, chiefly on the Blue Nile, distinguished by its light yellowish fawn colour, and the small Nilotic type in the south, ranging northwards from the Lado to the edge of the Kordofan deserts. Duiker are solitary, and are found in thickly bushed country, often at some distance from water.

Twelve may be shot by holders of an A or B licence.

*Uganda Blue Duiker*.—Shoulder height 12 in. This species (*Cephalophus aequatorialis*) is scarce, being found in the extreme south only.

There is no separate mention of it in the Game Ordinance.

*Klipspringer*.—Shoulder height 18 to 22 in. Horn length 4 in. The klip-

springer (*Oreotragus saltator*) is locally but sparsely distributed in rocky hills, chiefly in Kassala and Red Sea Provinces; it is also reported from Halfa and Dongola. The Sudan type belongs to the Abyssinian race. The flesh is good eating.

One may be shot by holders of an A or B licence.

*Oribi*.—Shoulder height 22 in. Horn length 5 in. The oribi (*Oribia montana*, Sudanese *mora* or *kajalla*) is common and widely distributed in hilly and grassy country north of lat. 5° N., chiefly in Sennar, Mongalla, and Bahr el-Ghazal Provinces. It is also fairly plentiful in the Red Sea mountains. Two races have been distinguished: the Abyssinian (*O. m. montana*) in the east, and the Nilotic (*O. m. aequatoria*) in the Nile valley south of the Sobat. Meat excellent.

Twelve oribi may be killed by holders of an A or B licence.

*Salt's Dikdik*.—Shoulder height 12–14 in. Horns 2 in. This tiny species (*Madoqua saltiana*, Arabic *beni israel*) is fairly common in the Abyssinian foothills and Red Sea range, principally in Kassala Province, but does not occur on the Rahad, Dinder, or Blue Nile. It is solitary, and inhabits thick bush near water, rarely leaving shelter during the day, but lying up under bushes like a hare. An allied race is found on the ironstone south of Dem Zubeir.

Twelve dikdik may be shot by holders of an A or B licence.

*Defassa Waterbuck*.—Shoulder height 48 in. Horns about 28 in. The waterbuck (*Cobus defassa*, Sudanese *katambu*, Dinka *tambur*) is generally distributed near the rivers south of lat. 11° N. The typical form, which extends up the Blue Nile into Abyssinia, differs slightly from that found on the White Nile and its western tributaries. Waterbuck are usually found in small herds in moist and bushy country.

Four may be shot by holders of an A licence; but not more than two of these in Kassala or Sennar Provinces, or on the White Nile north of Kodok. Export tax on living specimens £E.10. Traffic in hides, horns, and trophies prohibited.

*Mrs. Gray's Waterbuck*.—Shoulder height 36 in. Horns up to 27 in. This handsome species (*Cobus maria*, Dinka *til*) appears to be a northern form of the lechwe. It is found only in the swamps of the tropical zone, chiefly on the Bahr el-Jebel, Bahr el-Ghazal, Jur, and Sobat. Within this restricted area it now seems to be fairly plentiful. It is the most water-loving of the cobs, living on flooded land and in papyrus jungle, and is an excellent swimmer.

One may be shot by holders of an A licence. Export tax on living specimens £E.10. Traffic in hides, horns, and trophies prohibited.

*White-eared Cob*.—Height up to 36 in. Horns up to 20 in., slender. The white-eared cob (*Cobus leucotis*, Sudanese *hamaraia dyl*, Dinka *til*) is rather smaller than *Cobus maria*, but has much the same range and habits. It is usually found on or near the Nile, Sobat, or Bahr el-Ghazal, between lat. 8° 30' and 11° N., but extends south to the Nyam Nyam country. It

lives in marsh or near water, generally in large herds, and is often found in company with Bohor reed buck.

Four white-eared cob may be shot by holders of an A licence. Export tax on living specimens £E.10. Traffic in hides, horns, and trophies prohibited.

*Vaughan's Cob*.—This species (*Cobus vaughani*) is the common cob of southern Bahr el-Ghazal Province, being plentiful in the lower valleys of the ironstone plateau. It appears to be intermediate between *C. thomasi* and *C. leucotis*, but is distinguished from the latter by its bright fox-red coat.

Vaughan's cob is not separately mentioned in the Game Ordinance, being probably regarded as a variety of *C. leucotis*. Traffic in its hides, horns, and trophies is prohibited.

*Uganda Cob*.—Shoulder height 35 in. Horns 16–20 in. Spread 14 in. This species, which appears to be a local race of the true Uganda cob (*Cobus cobra thomasi*), is found on the ironstone in the south of Bahr el-Ghazal and Mongalla Provinces. It is fairly plentiful near the khors and rivers, preferring open and grassy country; and is often seen perched on termite hills. A smaller and lighter race, apparently peculiar to the Lado, was distinguished by Col. Roosevelt in 1915, and named *C. c. aluræ*.

Six Uganda cob may be shot by holders of an A licence. Export tax on living specimens £E.10. Traffic in hides, horns, and trophies prohibited.

*Reed buck*.—Shoulder height 30 in. Horns 11–15 in. Spread 9 in. The common reed buck (*Cervicapra arundinum*, Sudanese *bashmat*) is found in Bahr el-Ghazal and Mongalla Provinces, south of lat. 8° 25' N.; but is scarce and local. It frequents open savannahs, reed-beds, and thin forest, always near water, but lies up on dry land, avoiding swamps.

For purposes of protection it is reckoned with the next species.

*Bohor Reed buck*.—Shoulder height 33 in. Horns up to 13 in. This, the typical Sudanese form (*Cervicapra redunca cottoni*), is widely distributed in grassy and swampy country near water on the Blue and White Nile and their tributaries, ascending north of Jebel Ahmed Agar. It is most plentiful in Mongalla and Sennar Provinces, but is also numerous on the Bahr el-Arab, Bahr el-Ghazal, Bahr el-Zeraf, and upper Dinder and Sobat. It is distinguished from the Abyssinian race by its long, slender, and more sharply curved horns.

Eight reed buck may be shot by holders of an A licence; but not more than four of these elsewhere than in Kassala and Sennar Provinces. In these provinces traffic in the hides, horns, and trophies is prohibited.

*Dorcas Gazelle*.—Shoulder height 21 in. Horns up to 13 in. This small species (*Gazella dorcas*) is widely distributed north of lat. 11° N., principally in open steppe country.

Twelve may be shot by holders of an A or B licence.

*Isabelline Gazelle*.—Shoulder height 25 in. Horns up to 12 in. This light-coloured species (*Gazella isabella*, Sudanese *genai*) has much the same range as the Dorcas, but is most plentiful on the Red Sea coast.

Twelve may be shot by holders of an A or B licence.



*Heuglin's Gazelle*.—Shoulder height 27 in. Horns up to 12 in. This species (*Gazella tilonura*) is distinguished from the Isabella by its black tail and greater height. It is an Abyssinian form, preferring bushy plateaux from 3,000 to 5,000 ft. above the sea, and commonly found near water. In the Sudan scarce and local, mostly on the Atbara and Setit.

Twelve may be shot by holders of an A or B licence.

*Red-fronted Gazelle*.—Shoulder height about 26 in. Horns up to 11 in. This gazelle (*Gazella rufifrons*, Sudanese *el-hamra*), distinguished by its bright chestnut face, ranges through central Kordofan eastwards to the Blue Nile, Rahad, and Dinder. It is most common in south Kassala and on the Rahad, and keeps usually between lat. 12° and 15° N.

Twelve may be shot by holders of an A or B licence.

*Rothschild's Gazelle*.—This handsome gazelle (*Gazella albonata*) closely resembles *rufifrons*, of which it may prove to be a variety. The head and neck are paler, and the horns wider spread. It is found only in Mongalla Province east of the Nile, between Bor and Gondokoro, where it seems to have established itself since 1903.

Twelve may be shot by holders of an A or B licence.

*Grant's Gazelle*.—Shoulder height about 34 in. Massive lyrate horns up to 28 in. A distinct race of this species (*Gazella granti brighti*) is found in the Lado, ranging eastwards to Lake Rudolf. It was reported from the Kara-Kara country in 1912, and from the Kideppo in 1917. Though found sometimes on rocky hills, it prefers open country, often consorting with the zebra, oryx, topi, or giraffe. The Lado race is smaller and paler than the type form.

Twelve may be shot by holders of an A or B licence.

*Ariel*.—Shoulder height 32 in. Horns average 12–14 in. The ariel or aoul (*Gazella soemmerringi*) is one of the largest and most widely distributed gazelles of the eastern Sudan. It ranges south from Halfa Province to the Sobat, is plentiful near Suakin, but most abundant in Sennar and Kassala Provinces, especially on the Dinder, where it is extremely numerous. It only occurs west of the Nile in White Nile Province. The ariel is heavily built, but very swift. It is often found some distance from water, and generally in large herds, sometimes consorting with oryx and hartebeest.

Twelve may be killed by holders of an A or B licence. Traffic in hides, horns, and trophies prohibited in Kassala and Sennar Provinces.

*Addra*.—Shoulder height 36–40 in. Horns up to 14 in. The addra (*Gazella dama ruficollis*, Dongolese *addra*, Dinka *ril*) is the Sudanese form of the Dama gazelle. It is the largest of the gazelles, and is coloured white, with a chestnut collar. The addra ranges the sandy country north of lat. 13° N., browsing on marakh and acacia scrub. It is found chiefly in Kordofan, but extends to Sennar and Dongola, keeping south of lat. 20° N. The addra has been greatly reduced by the Kordofan Arabs, who hunt it for food, and sell its dried flesh.

Six may be shot by holders of an A licence. Export tax on living specimens £E.5.

*Beira*.—Shoulder height up to 20 in. Horns up to 5½ in. This small hill-antelope (*Dorcotragus megalotis*) is rare and local. It is found only on the high rocky ground near the Blue Nile above Roseires. The beira is a good climber, with the habits of the klipspringer, and difficult to locate. It is not mentioned in the Game Ordinance.

*Beisa*.—Shoulder height 48 in. Horns up to 32 in., longest in the female. The beisa, or beida (*Oryx beisa*), occurs locally, in one or two places east of the Atbara, and on a patch of barren land in Red Sea Province near lat. 18° N. It is also reported from the Kara-Kara country.

One may be shot by holders of an A licence. Export tax on living specimens £E.10. Traffic in hides, horns, and trophies prohibited.

*White Oryx*.—Shoulder height 40 in. Horns 34–40 in. The white or scimitar-horned oryx (*Oryx leucoryx*, Sudanese *abu harb*, or *mathat*) is a large, pale species, with chestnut markings. It was formerly numerous in north-west Kordofan, whence the herds migrated south in the spring as far as lat. 13° N., between long. 28° and 30° E. It has, however, been almost exterminated by the Arabs in this region. The oryx occurs in Dongola and in the Suakin district, and extends westward from the Sudan into Tibesti. It frequents dry open plains and lightly-bushed country, living chiefly on the leaves and twigs of acacia.

Four may be shot by holders of an A licence. Export tax on living specimens £E.10. Traffic in hides, horns, and trophies prohibited.

*Roan Antelope*.—Shoulder height 55 in. Horns 24–34 in. The Sudan roan antelope (*Hippotragus equinus bakeri*, Sudanese *abu urf*) is locally distributed from the Setit southwards. The Setit, upper Atbara, upper Dinder, and Blue Nile above Suleil are its chief strongholds; but it also occurs on the ironstone south of Dem Zubeir and is plentiful in Mongalla south of Gondokoro. It was formerly numerous in Nuba Mountains near Lake Abiad, but there now seems little game in this region. The roan is the most savage of all antelopes. It prefers high bush-country and often travels long distances from water, only drinking twice a week.

Four may be shot by holders of an A licence, but not more than two of these in Kassala or Sennar Provinces, or on the White Nile north of Kodok. Export tax on living specimens £E.10. Traffic in hides, horns, and trophies prohibited.

*Addax*.—Height about 40 in. Horns 26–38 in. The addax (*Addax nasomaculatus*, Sudanese *kubaji*) is perhaps the rarest of the Sudan antelopes. It is a Saharan species, ranging to south Tunis and Algeria. In the Sudan its chief habitat is the so-called addax ground in the extreme west of Dongola Province—a desert and waterless region which it shares with the adda, oryx, and wild sheep. It also occurs in the sand-dunes of Kordofan, just south of lat. 16° N. and west of long. 28° E.

Six addax may be shot by holders of an A licence, but this number is seldom obtained. Export tax on living specimens £E.10.

*Giant Eland*.—Shoulder height 5–6 ft. Horns 25–30 in. Spread 12 in.

The magnificent giant eland (*Taurotragus oryx gigas*) appears to be widely distributed in Bahr el-Ghazal and Mongalla Provinces, especially along the northern edge of the ironstone region. It is also found in the hilly country on both sides of the Bahr el-Jebel south of Gondokoro, and in the valleys of the Uganda border. The eland is the least pugnacious of all antelopes. It goes in large herds, frequenting savannah and wooded country, and lives on grass and the leaves and shoots of trees, tearing down the branches with its horns. Its meat is tender and juicy.

One may be shot by holders of an A licence. Export tax on living specimens £E.10. Traffic in hides, horns, and trophies prohibited.

*Harnessed Bushbuck*.—Shoulder height 30–35 in. Horns 11–18 in. The Nile race of bushbuck (*Tragelaphus scriptus bor*, Sudanese *abu naba*) is found on the rivers of Bahr el-Ghazal and Mongalla Provinces and in the extreme south-west of Kordofan, usually in thick bush or acacia country. It is most plentiful in Mongalla, and has been reported from Kideppo valley. Bushbuck are of solitary habit and very shy, seldom coming out to feed until dusk.

Four may be shot by holders of an A licence.

*Abyssinian Bushbuck*.—Shoulder height 26 in. Horns up to 12 in. This species (*Tragelaphus decula*), in which the 'harness' stripes are usually absent and the general colour yellowish, is found locally near water on the upper Blue Nile and its tributaries, its range being much the same as that of the kudu.

For protection purposes it is reckoned with the preceding species.

*Sitatunga*.—Shoulder height 36–43 in. Horns 20–35 in. This shy and elusive swamp antelope (*Tragelaphus spekei*) ranges north from Uganda to the papyrus swamps of the Bahr el-Ghazal, Bahr el-Homr, and Jur rivers. It is distinguished by the elongated hoofs on which it crosses the marshes and soft mud-flats. It only leaves the papyrus-swamp at night, to feed on the neighbouring savannah, and spends most of the day in the water; sinking until only its nose appears above the surface when disturbed or alarmed. It is a strong swimmer, but cannot move quickly on dry land.

Not mentioned in the schedules of the Game Ordinance.

*Great Kudu*.—Shoulder height 52–60 in. Spiral horns 45–60 in. on the curve. The great kudu (*Strepsiceros capensis*) is one of the rarer antelopes of the Sudan. As late as 1912 it was said to occur locally in Kordofan and Nuba Mountains, from about lat. 14° N., southward to Talodi, in places where rock and bush were combined; but it is doubtful whether any remain in this region. Its chief habitats are now the Red Sea range, where it seems to be holding its own, the Atbara and Setit, and vicinity of the Blue Nile. It is said to be flourishing in the sanctuary and has been seen on the Nile at Jebelein during the rains. It prefers hilly bush-country and seldom retreats more than four miles from water. The meat is excellent.

One may be shot by holders of an A licence. Export tax on living specimens £E.10. Traffic in hides, horns, and trophies prohibited.

*Lesser Kudu*.—Shoulder height 41 in. Horns 30 in. on the curve. This graceful and brightly coloured species (*Strepsiceros imberbis*) is reported from the Kideppo valley. It frequents dense lowland jungles near water.

Not mentioned in the schedules of the Game Ordinance.

*Giraffe*.—The giraffe (*Giraffa camelopardalis*, Sudanese *zeraf*, Dinka *mehr*) is widely distributed in the Sudan from Kordofan southwards. Its range is approximately that of the elephant, but it is not found in swampy country, and retreats to drier ground when the low savannahs become marshy during the rains. Several local races have been distinguished. The Nubian giraffe (*G. c. typica*), with white unspotted forelegs below the knees, is found on the Abyssinian frontier in Sennar Province, and on the upper Dinder and Rahad. The Kordofan race (*G. c. antiquorum*), which closely resembles it, is abundant in south Kordofan, west of Lake No and south of lat. 12° N. It reappears on the borders of Darfur at about lat. 15° N., between long. 27° and 28° E., and is common on the savannahs of north Bahr el-Ghazal Province. The south Lado race (*G. c. cottoni*) is found on the Nile banks south of Lado, and ranges east along the Uganda border. The giraffe makes long seasonal migrations, descending the Nile north of Jebelein during the rains. It is very numerous in Sobat-Pibor and Mongalla Provinces.

One may be shot by holders of an A licence, subject to payment of an additional fee of £E.10. Export tax on living specimens £E.24. Traffic in hides, horns, and trophies prohibited.

*Bush-pig*.—The Abyssinian bush-pig (*Potamochoerus hassama*) occurs locally, on the Abyssinian border and in Bahr el-Ghazal Province, but is rare. It frequents dense jungle and is seldom seen during the day.

It is not mentioned in the Game Ordinance.

*Wart-hog*.—Shoulder height 26–30 in. Upper tusks 12–25 in. The wart-hog (*Phacochoerus aethiopicus*, Sudanese *halluf*, Dinka *dyerh*) is locally common. Several races have been distinguished. The type form is found chiefly near the Abyssinian frontier on the Atbara, Blue Nile, and their tributaries. The Nile race, distinguished by slight differences in the skull, is common on the ironstone plateau and ranges north of the Sobat and Bahr el-Ghazal rivers. Wart-hogs are numerous in the hills east of Jebelein. They live in burrows, sometimes in forest, but more generally in open or lightly-bushed country, and go in pairs.

Six may be shot by holders of an A or B licence.

*Hippopotamus*.—The hippopotamus (Sudanese *galoba*) is abundant on the White Nile south of Kodok, and occasionally descends as far as Dongola. On the Bahr el-Ghazal and other southern rivers it is so common as to constitute a hindrance to navigation. It is found in smaller numbers on the Blue Nile and Dinder, does not occur on the Rahad, and is scarce on the Atbara and Setit.

Four hippopotami may be shot north of Kodok by holders of an A or B licence. South of this point they are unprotected. Export tax on living specimens £E.5.

## CHAPTER IV

### HISTORY

History of the Sudan up to A. D. 1899—The regeneration of the Sudan,  
A. D. 1899–1917

#### HISTORY OF THE SUDAN UP TO A. D. 1899

##### *Egyptian Rule in Nubia*

THE country south of the First Cataract was known to the ancient Egyptians as the land of the Blacks (Ta-Nehe-su = Balad Sudan). It was always of the first importance as supplying Egypt with slaves, ivory, and gold, and the beginnings of intercourse probably go back to the Archaic period of Egyptian history. The first definite mention of the Sudan dates from about 3,800 B. C., when Seneferu, a king of the fourth dynasty, made a great raid to the south, and brought back numerous cattle and slaves. In early times the southern boundary of Egypt was at Elephantine, near Aswan, but under the eleventh dynasty, about 2,600 B. C., Behen or Halfa was occupied, and remained in Egyptian hands till about 1,000 B. C. Under the great kings of the eighteenth dynasty Egyptian supremacy was extended as far as the Blue Nile, and the whole territory was organized in provinces under the overlordship of the 'Prince of Kash', who had his capital at Napata (Merowe) at the foot of the Fourth Cataract. It is from this period that the important temple ruins at Halfa, Sulb, Semna, &c. date, and under the rule of the viceroys at Napata the civilization and religion of Egypt became firmly implanted in Nubia.

##### *Nubian Empire*

Under the New Empire the importance of Napata increased, and Nubia gradually shook off its dependence on Egypt.

During the ninth century the priests of Amen migrated with their god from Thebes to Napata, and owing to the prestige which their capital thus acquired, the Nubian princes came to regard themselves as the rightful lords of all Upper Egypt.

About 720 B.C., Piankhi, one of these princes, captured Memphis and Hierapolis, and made himself master of the whole of Egypt. His successors formed the twenty-fifth dynasty, but the greatest of this line, Tirhakah, was defeated by the Assyrians in 670 and driven back into Nubia. His successor, Tanut Amen, met with a similar fate.

During the following century Nubia remained independent and powerful, and the two great kings of the sixth century, Heru-sa-atef and Nastasen, subdued all the peoples of the eastern desert, and ruled over the whole Sudan from the First Cataract to the Blue Nile. A second capital was built at Meroe, north-east of Shendi, but the great temple of Amen at Napata remained the theocratic centre of the kingdom.

It was in the reign of Nastasen that Cambyses invaded the Sudan and was defeated by the Nubian king.

During the Ptolemaic period the Nubian kings several times asserted themselves, and at the beginning of the second century, Arq Amen pushed his frontier north towards Elephantine, and proclaimed himself king of all Egypt. Nubia is described by Graeco-Roman writers as governed by queens who bore the title of Candace. One of these conquered Syene and Philae in 25 B.C., but the prefect of Egypt drove back the Nubians and afterwards captured and destroyed the royal city of Napata. It is conjectured that this Candace is the Amen Tarit, who reigned with Netek Amen, and who left numerous monuments at Meroe and at Naga north-east of Khartoum.

During the Roman period Nubia seems to have suffered a great decline, and the line of the priest kings of Amen came to an end.

### *Christian Nubia*

The Romans of the later empire had to deal not with a settled kingdom but with nomad tribes, the Blemmyes of

the eastern desert and the Nobatae on the west. The former seem to have been a Hamitic people, the ancestors of the Beja, and of the modern Bisharin.

In the first half of the sixth century after Christ, Silko the Christian king of the Nobatae, conquered the Blemmyes and established his capital at Dongola. This marks the foundation of the second Nubian kingdom, and like the first, it derived its religion and culture from Egypt. About this time all Nubia was converted to Christianity, and the temples at Pselchis and elsewhere were turned into churches. The Nubians were from the first Monophysite, and eventually were dependent on the Coptic Patriarch of Alexandria, but their ecclesiastical language was Greek. The remains of their churches and monasteries are found scattered through the Sudan from Halfa to Soba, south of Khartoum.

After the conquest of Egypt by the Arabs, the Christian kingdom of Nubia was also forced to pay the Bakt, or tribute, but it retained its power and practical independence.

In A. D. 722 the Nubian king Cyriacus marched into Egypt with a great army to the help of the persecuted Copts, and he was only induced to withdraw from before Cairo by the liberation of the Coptic Patriarch.

In the course of time Christian Nubia came to form two kingdoms, Dongola or Makorra in the north, which extended down the Nile as far as Philae, and Alwa in the south, which had its capital at Soba south of Khartoum. According to Arab writers the inhabitants of the two kingdoms belonged to different stocks. It is uncertain at what time Christianity in Nubia finally disappeared. It still existed in the first part of the sixteenth century, when the Nubian Christians sent messengers asking for help to the Portuguese missionaries in Abyssinia.

#### *The Fung, Turks, Darfur*

By the beginning of the thirteenth century the power of the Christian kingdoms was on the wane, and in the next two centuries Northern Nubia was gradually overrun by the

Mohammedans. From very early times there had been a movement of Arab tribes into the eastern deserts, which gradually absorbed the aboriginal Hamitic nomads, and it was probably these tribes, even more than the organized power of the Arabs of Egypt, which brought about the fall of the Nubian kingdoms.

During the fifteenth century a new power, that of the Fung, had been growing up to the south of Alwa, and in 1504 their chief Amara Dunkas conquered Soba, and founded a Mohammedan kingdom with its capital at Sennar. The Fung or Funj, appear to have been of mixed Arab negro race, and to have been confederated with Arab tribes such as the Gawazma. It is in any case clear that their kingdom of Sennar was a typical Mohammedan state, like the other kingdoms of the Sudan. Their realm was limited on the south-east by the Abyssinians and on the south-west by the Shilluks, but they gradually extended their power northward down the Nile to Dongola. Their kingdom formed a loose confederacy, and there were semi-independent meks or kings at Shendi, Fazogli, &c..

Meanwhile the Sultan Selim, who had conquered Egypt in 1517, sent a force of Bosnian Turks into Lower Nubia, who conquered the Arab tribes between the First and Third Cataracts, and established garrisons at Aswan, Ibrim, and Saye. Their descendants ruled the country for 300 years after the manner of the Mameluke beys in Egypt.

About this time another Mohammedan power had grown up in the west. The negroid Dagu of Darfur were invaded in the fourteenth century by the Tungur Arabs coming from the north-west, and the composite result received the name of Fer or Fur. Under Suleiman Solong, who reigned from 1596 to 1637, Darfur became a powerful state, and extended its power eastward over Kordofan. It always belonged, however, rather to the Wadai-Borku group of states than to those of the Egyptian Sudan.

In the eighteenth century the kingdom of Sennar declined, and eventually in 1786 the power of the Fung kings was



usurped by the Hameg tribe, though the former kept their nominal supremacy.

During these centuries the condition of the Sudan had been fundamentally changed. The population, especially in northern Nubia, underwent a process of Arabization, and the age-long connexion with Egypt, through trade, religion, and civilization almost disappeared.

The Nubians, especially the people of Dongola, became the chief merchants and slave traders of the Sudan. But the slaves now came far less from the south than from the Dar Fertit and the Banda country eastward through Darfur, and the majority of them came into the hands of the Arabian merchants of Suakin rather than to Cairo. The revival of Egyptian influence and of the Upper Nile slave trade was entirely the work of the middle decades of the nineteenth century (1820–80). Immediately before the Egyptian conquest the Sudan was split up into a number of minute kingdoms, the wreckage of the Fung Empire. Darfur was the only state of importance, but Shendi and Sennar remained important centres of trade.

*Annexation by Egypt : Exploitation (A.D. 1820—81)*

In A.D. 1820 the Sudan was annexed to Egypt by Mehemet Ali, who had amputated the latter country from the decaying body of the Ottoman Empire. In the Sudan he hoped to find gold, slaves, and recruits for his army in vast quantities. Only the gold failed him. For his own security also he needed to give employment to his turbulent army and to suppress the fugitive remnants of the Mamelukes who had taken refuge at Dongola. The work of annexation he entrusted to his youngest son Ismail, who in 1822 was entrapped and burnt alive at Shendi. But the work went rapidly forward. Egyptian rule was extended south to Fazogli and west to the borders of Darfur. In 1822 Khartoum was founded as the centre of administration. The first twenty 'governors' were Egyptians (A.D. 1825–77). At Mehemet Ali's death in 1849 Egyptian power reached up the

Nile to Kodok, and eastwards included all the Beja country. Kassala, and the Tokar districts on the Abyssinian border. Traders in ivory and slave raiders soon pushed beyond the limits of actual administration, and were able easily to frustrate the Khedive Said (A.D. 1854-63) who wished to abandon the whole of the Sudan. He had to content himself with issuing the first proclamation of the abolition of slavery, of no validity save on paper. Henceforward (from the year 1860 in accelerated progress) the negro peoples of the Nile valley and of the Bahr el-Ghazal were the unceasing prey of the organized Arab slaving companies of 'Khartoumers' despite repeated (e.g. 1858, 1863, 1869, 1872) Khedivial humanitarian edicts. For twenty continuous years the southern Sudan was devastated, and the inhabitants, through raids, slaughter, famine, and the horror of caravan-marches, reached the lowest level of misery. The appointment by the Khedive of European governors of the Upper Nile or of Khartoum, such as Baker (1869-71) and Gordon (1874-9), proved only a temporary hindrance to a traffic based on greed, stimulated by lust, and sanctioned by religion and custom, on whose maintenance the whole agricultural welfare alike of the Sudan and of Egypt was made to depend. The megalomania and extravagance of the Khedive Ismail (A.D. 1863-79) extended the frontiers of the Egyptian Sudan in all directions. On the south Sir Samuel Baker reached the borders of Unyoro, his successor, Charles George Gordon, however, found it necessary to withdraw the most southerly Egyptian garrisons from the Bari country. Darfur was annexed in A.D. 1874 in Ismail's name by Zobeir, the semi-independent prince of Arab slave-traders. Zobeir's son Suleiman revolted (on his father's detention at Cairo) in the Bahr el-Ghazal Province, but was suppressed and slain by Gordon's lieutenant, Romolo Gessi, and Egyptian rule came within sight of the Nile-Congo Divide. Another of Gordon's lieutenants, the German doctor Emin, governed the Equatorial province up to Lake Albert, and the Austrian soldier Slatin was appointed to Kordofan. On the east

Ismail's possessions, won largely by purchase and diplomacy, included Suakin, Massawa, and much of the south coastal region. Bogos and Harrar were wrenched from Abyssinia in 1874; but the Abyssinian King John inflicted severe defeats on Ismail's worthless troops at Gundet in 1875 and Gura in 1876, and these districts were ceded back to Abyssinia a few years later. to obtain Abyssinian help against the Dervishes. When Ismail was deposed in 1879 the whole of his vast Sudanese possessions were in a state of indescribable misery and bankruptcy, and the whole of the Egyptian administration of the land was rotten at the core. At the root of the whole evil was the slave-trade, which would revive to-morrow if the English administration of the Sudan ceased and the French lost control of Wadai.

Tewfik's accession (June 1879) soon caused the resignation of Gordon, who left the Sudan in December 1879, and of Gessi, who left next year. The old order of things returned unchecked or stimulated by Rauf Pasha at Khartoum (governor 1880-1). Gordon's withdrawal destroyed the last hope of peace in the Sudan.

*The Mahdia and the Reconquest (A.D. 1881-99)*

Only the baldest summary can here be given of the epic period of Sudanese history known as the 'Mahdia', the conquest of the Sudan by the 'Dervishes' and its reconquest by the Anglo-Egyptian forces.

Mohammed Ahmed, an ascetic *fiki* of the despised Berberine race of Dongola district, was a man inspired by genuine religious enthusiasm and faith in his own divine call for the purification of Islam; a visionary, he was yet of the shrewdest intelligence. In August 1881, when he was about 40 years old, he first proclaimed a holy war against all infidels, Turks, and the Egyptian oppressors of the country. He appropriated the traditional Sunni title and personality of the 'Mahdi', and his superb oratory, early military successes, and personal attractiveness rallied the greater part of the population of the northern Sudan to his cause. Chief

among these were the fierce Baqqara cattle-owning tribes of the western deserts, alarmed by the efforts, however feeble and in part insincere, which the Government was making to abolish slavery. For the slave-trade was 'at once their religion, their occupation, and principal source of income'. Religious zeal was, however, the chief cause and also the binding-force of the rising. Hatred of the Egyptian tax gatherer, official, and oppressor had spread discontent universally through the country and brought all the wretched to the Mahdi's banner. The inefficiency of the Egyptian army of occupation, men and officers alike, gave the movement unexampled opportunity of success. Eluding capture by a timely 'Hegira' to Jebel Gedir in the Nuba Mountains, the Mahdi defeated two governors of Fashoda, captured after long siege the Egyptian garrisons in Kordofan (January 1883), and annihilated the avenging army of 10,000 men under Hicks Pasha at Shekan, a few miles south-east of El-Obeid, on November 5, 1883. This caused the surrender of Slatin in Darfur next month. His 'conversion' to Islam had only postponed the inevitable. In the eastern Sudan the Egyptian garrisons were beleaguered and Suakin was on the point of capture. The Government decided to evacuate the whole Sudan, and despatched Gordon to withdraw the garrison and provide a working-government in its stead. The task was one of enormous difficulty. The Government appointed Gordon and dictated his policy, yet refused him the help of Zubeir Pasha which he regarded as the chief essential of success. Gordon who had arrived in Khartoum on February 18, 1884, seems thereupon to have taken upon himself the impossible task of defending the Sudan against the Mahdi in the hope of thereby bringing about a British military expedition, notwithstanding that such a course was contrary to the known policy of the British Government. Khartoum was soon invested by Dervishes and Gordon's position, in the face of odds which he himself underrated, became desperate. On January 26, 1885, Khartoum fell before the Dervish assault and Gordon himself was killed. The inhabitants

surviving were removed to the Dervish capital, Omdurman. The British expedition was recalled in June 1885. Sennar surrendered on July 30, on which same day Kassala was captured. Some of the garrisons in the eastern Sudan were rescued by the Abyssinians, King John by the Treaty of Adowa (June 3, 1884) receiving back Ismail's acquisitions as his price for aid. The whole of the eastern Sudan save Suakin was practically abandoned. A Dervish advance to the north was checked at Ginnis on December 30, 1885, but this was defensive strategy only. By April 1886 the frontier of Egypt was withdrawn to Wadi Halfa. Meanwhile the Mahdi, who in four years had made himself undisputed ruler of two million square miles of territory, died at Omdurman on June 22, 1885. The Khalifa Abdullah, of the Taaisha section of Baqqara, who had been his right hand and chief general, seized the power, and, with some difficulty maintained his position in the face of constant rebellion at home and exhausting war with the Abyssinians on his frontiers. Not until 1889 was he free to resume the plan of the invasion of Egypt. Wad el-Nejumi his Emir and his eleven thousand Dervishes were, however, defeated at Argin, a few miles beyond Wadi Halfa, on July 2, 1889, and destroyed at Toski by Sir Francis Grenfell a month later (August 3), in a battle which proved the sterling merit of the new Egyptian model army, carefully trained for years by and under the leadership of British officers. The battle was decisive in that the Khalifa was henceforth reduced to the defensive. He lost Tokar (to the Egyptian army) on February 8, 1891, and Kassala (to the Italians) on July 17, 1894. In the far south his emirs' efforts to conquer the Upper Nile and Bahr el-Ghazal had never met with complete success; Emin always lurking quietly out of their reach. Darfur was always restless and the Nuba Mountaineers remained defiant. Yet the Khalifa, a man of great political sagacity and force of character, kept his Dervishes loyal to him, played still successfully on their religious fanaticism (a difficult task when the Mahdi was dead) and was always dangerous.

Under his rule the country suffered great woes from battle oppression, disease, and famine (as especially in 1888-9). The population was said to have been reduced from  $8\frac{1}{2}$  to 2 millions. Whole tracts were deserted and went out of cultivation; towns were destroyed; tribes which opposed him (as the Jaalin, Shukria, and Kababish) became all but extinct. Omdurman itself, however, grew into a conglomeration of 150,000 souls swarming in squalid, pestilential, mud hovels. But the loyalty of the Baqqara, an efficient spy-system, and the terror of the Khalifa's system of government, triumphed over all the misery and discontent of the population.

The occasion determining the decision of the British Government in 1896 to reconquer the Sudan was the Abyssinian defeat of the Italians at Adua on March 1 of that year, and the fear lest this should incite the Dervishes to attack Kassala. An advance on Dongola would divert their attention. But the real motives lay deeper, and were three in number, viz. : (1) Policy, i.e. the security of Egypt and safeguarding of her water supply; (2) Philanthropy, i.e. the redemption of the Sudanese from misery, and the final destruction of the slave-trade; (3) Sentiment, i.e. English *amour propre* and the popular indignation at the fate of Gordon. All three co-operated strongly to move the Government, and the Sirdar, Sir Herbert Kitchener, was ordered to take the field. Once this great offensive was begun it was impossible to leave the work half finished. It was accomplished with clockwork precision. The first brush with the enemy occurred at Firket on June 7, 1896. On September 23 Dongola was re-occupied and Merowe became army head-quarters for the next few months. Next year, 1897, Abu Hamed was captured on August 7, and Berber occupied on August 31. The railway was built to Abu Hamed, the Suakin-Berber road was reopened, and Kassala was taken over once more by Egypt on Christmas Day.

In the spring of 1898 the army marched south again from Berber. On April 8 the Dervish army of 12,000 men under Mahmud, the exterminator of the Jaalin tribe, was attacked

and routed in its position on the Atbara. On September 2 the Khalifa himself and his main army of 40-50,000 men fell upon the Anglo-Egyptian army of 22,000 men under the Kerreri hills, a few miles north-west of Omdurman. The Khalifa lost 27,000 men killed and wounded and the survivors fled to the desert. He himself escaped, to be finally caught and slain in battle at Um Debreikat on November 24, 1899, where Sir Reginald Wingate was in command. Before this, the Sirdar had hastened south to interview the French expedition under Marchand at Fashoda on September 19, 1898, and the claim of Egypt to the valley of the Upper Nile was presently recognized by the French Government, Marchand leaving Fashoda and making his way to the French Somali coast. Sennar, Karkoj, Roseires, Gallabat, Fazogli, were retaken. El-Obeid was occupied on December 17, 1899. The Sultanate of Darfur was re-established, and Ali Dinar, one of the Khalifa's prisoners at Omdurman, was restored to the throne of his ancestors as client prince. Osman Digna, the vigorous and elusive leader of the Dervish forces for many years in the eastern Sudan, was captured on January 18, 1900. On December 22, 1899, Sir Reginald Wingate succeeded Lord Kitchener as Sirdar and Governor-General of the Sudan, a post which he retained for exactly 17 years (to December 18, 1916). The whole work of the regeneration of the Sudan has taken place under his auspices. The total cost in money of the reconquest of the Sudan 1896-9 was £E.2,412,000, of which the British Government contributed some £E.780,000. But the country was found devastated, depopulated, ruined. The harder task of reconstruction remained.

#### THE REGENERATION OF THE SUDAN, A. D. 1899-1917

##### *The System of Government*

The first task after reconquest was to establish the political status of the Sudan and to make provision for its government. Simply to hand the country back to Egypt was, in view of

its past and of the share in its re-occupation taken by Great Britain, impossible. Direct annexation by Great Britain was similarly unfair to Egypt and was sure to excite opposition by other European Powers. Only the shadowy claims of Turkey could in justice and in safety be completely disregarded. Hence a *condominium* of Great Britain and Egypt in the Sudan was created by an agreement between the British Government and that of the Khedive, signed at Cairo on January 19, 1899, the terms of which were extended to the town of Suakin by a subsequent agreement of July 10, 1899. The system of government thereby established is described in detail hereafter.<sup>1</sup> Its nature and provisions emancipated the Sudan from any possibility of interference by any other than the two Powers concerned (as by the machinery, unhappily familiar in Egypt, of capitulations, mixed tribunals, foreign Consuls, and the like) and disarmed opposition by any other Power. None such, save for a feeble and ineffective protest by the Sultan of Turkey, was formally offered, and no formal assent by such was requested. The share of the British Government in this system of administration was, in the Preamble to the Agreement, based definitely on the 'right of conquest'. Its only later modification was the creation in January 1910 of the Governor-General's Council. The control of the British Government is exercised by the Foreign Office through their agent H.M. Consul-General at Cairo. Under the terms of this Constitution the Sudan has been since administered. During this period there have been no enactments concerning the Sudan passed by the British Parliament. The somewhat anomalous, if not unique, system of government, has worked admirably. Its semi-military character was and is inevitable, but the civilian element in it constantly tends to increase.

### *Frontier History*

The frontiers of the Sudan, as fixed by the Agreement of January 19, 1899, and by subsequent arrangements, are

<sup>1</sup> See 'Government and Administration', p. 278.



conterminous with Egyptian, Belgian, French, Italian, and Abyssinian territory and with the Uganda Protectorate. The history of the last five frontiers and of the relations of the Sudan Government with the semi-independent Sultan of Darfur may be briefly summarized.

*The Belgian Frontier.*—The Belgian frontier from 1899 to 1910 consisted of two distinct sections : (1) the Lado Enclave and (2) the Belgian-Congo frontier.

1. The Lado enclave was a large tract of country, with a population of some 50,000, assigned to the Congo Free State by an Agreement signed at London on May 9, 1906, which itself cancelled the Brussels Agreement of May 12, 1894. This earlier Agreement had surrendered to King Leopold all the country south of lat.  $10^{\circ}$  N. and east of long.  $35^{\circ}$  E. at a time when the Upper Nile valley was either in Dervish possession or No Man's Land, and the Belgian effective occupation was limited to a few posts on the river near Wadelai.<sup>1</sup> The Agreement of 1906 contracted and defined the boundaries of Belgian territory on and west of the Bahr el-Jebel. By this Agreement the 'Lado Enclave', as it was called, reverted to the Sudan on the death of King Leopold, and it was in consequence formally surrendered to the Sudan Government without any friction on June 16, 1910. By a proclamation of August 4, 1910, the former Lado Enclave became part of Mongalla province. The subsequent frontier arrangement with Uganda<sup>2</sup> transferred the southern portion of it to the latter Protectorate.

2. In 1904 the Belgian 'Lemaire Mission' coming from the Congo Free State established five fortified posts on the Sudanese side of the Nile-Congo Divide in Bahr el-Ghazal Province, and King Leopold showed so obvious a disposition to annex the district thus temporarily occupied that a 'somewhat acute political tension' resulted. This was ended by the Agreement of May 9, 1906, which fixed the Nile-Congo Divide as the frontier as far as the French frontier to the north,

<sup>1</sup> Chaltin's Congo column occupied Rejaf in 1897.

<sup>2</sup> See p. 175.

viz. the source of the Mbomu River.<sup>1</sup> By 1907 all Congolese troops had withdrawn to their side of this frontier. In 1908 the Congo Free State became a colony of Belgium, since which time relations between the Sudan and the Belgian officials have been always cordial. A joint Boundary Commission for the delimitation of the frontier was arranged for the end of 1914; its work, postponed by the outbreak of the European War, was carried out in 1915. By the Agreement of May 1906 the so-called 'Mahagi Strip' of land giving access from the west to Lake Albert was leased to the Belgian Congo, and this strip was actually delimited in 1913. Since the readjustment of the Sudan-Uganda frontier of 1914 this now concerns Uganda only.

Apart from some recent disturbances with native chiefs where the three frontiers, Belgian, French, and Sudanese, meet, to suppress which the officials of the three countries co-operated heartily and successfully,<sup>2</sup> nothing has happened to disturb the peace of this frontier. The ever-threatening peril of sleeping-sickness (bequeathed first to the Sudan with the Lado Enclave, and a serious menace on the Yei River) calls for similar co-operation and goodwill in the enforcement of such quarantine and other precautions as may be possible.

*The French Frontier.*—Difficulties as to this frontier first arose out of the question of the ownership of territory immediately to the north of the Nile-Congo Divide, in particular the Bahr el-Ghazal Province.

The Egyptian authorities at Khartoum had been in the habit of leasing out at a rental to slave dealers, nominally for the purposes of the trade in ivory, tracts of territory to which they had no legal right. Chief among these was the Bahr el-Ghazal, and here the slave-dealing interest became a political power, against which the Egyptian Government had sometimes to wage war, not always with success. However, the subjugation of the slave dealers was accomplished by

<sup>1</sup> Fixed by the Agreement of August 14, 1894, between France and the Congo Free State.

<sup>2</sup> See below.

Romolo Gessi in the period 1878-80, and Gessi became governor of the province until his death shortly afterwards. A few years later (1884) the Egyptian Government in face of the increasing strength of local Mahdism was forced to abandon the province which was now nominally subject to the Emirs of the Khalifa.

It was at this juncture that the attention of both the Belgian King Leopold and the French Republic was directed to this region, which had now become temporarily a No Man's Land. But the claims of Great Britain received recognition in 1890 from the German Government, and a similar acknowledgement on the part of the Belgian monarch may be inferred to have been given by his acceptance, in May 1894, on a lease, of the region of the basin of the Upper Nile, the locality of Fashoda being leased only for the duration of King Leopold's reign.

A few months later the Belgian king, on behalf of the Congo Free State, in a treaty with France renounced his rights of occupation and the exercise of influence which had been accorded to him by the treaty with Great Britain, and this was thought by the French to clear their way to the Nile. An expedition under Marchand crossed the Nile-Congo Divide and after tremendous exertions made its way down the Sueh affluent of the Nile to Fashoda, since named Kodok, establishing *en route* various posts in the Bahr el-Ghazal (July 1898). On September 19 of the same year Kitchener arrived from Omdurman and hoisted the British and Egyptian flags and a few days later occupied Meshra el-Rek. The *impasse* ended with Marchand's withdrawal via Abyssinia in the following December, and a Declaration was signed by Great Britain and France at London, March 21, 1899.

By this Agreement, completing the Convention between Great Britain and France of June 14, 1898, the frontier, between the Sudan and French spheres of influence, was defined. In 1899 the French had hardly penetrated east of Lake Chad, and it was not until their effective occupation of

Wadai and its capital Abesher in 1909 that direct relations were established by the border officials of both countries. In 1910 these met to concert measures against the slave-trade, of which Wadai had long been the last and flourishing refuge, and by a system of 'passes' to restrict the travelling companies of merchants and pilgrims to their professed and legitimate employments. In 1912 the question, difficult here as on the Eritrean frontier, of the conditions under which native chiefs and their adherents should be allowed to migrate over the frontier, was subject to similar discussion, and the working principle of disarmament and removal some distance 'inland' (unless in the case of fugitives from justice) was adopted. The actual delimitation of the frontier and the project for a railway to link the Bahr el-Ghazal and Upper Ubanghi had hardly come under consideration when they were stopped by the outbreak of the European War. In 1916 a rebellious chief, Mopoi, gave trouble to French, Belgian, and Sudanese authorities alike. German intrigue, as also Pan-African propaganda, was suspected but not proved. Joint action by the officials on the spot suppressed the rising, which had caused the French some loss. In 1917 an old elephant-poacher Krikri had also to be dealt with on the frontier. Throughout recent years the relations between the officials of the two countries have been most friendly. Their interests are identical.

*Darfur*.—Darfur, which for 18 years, 1899-1916, constituted a dependent State lying between Sudan territory and French Equatorial Africa, is a land rectangular in shape, measuring some 450 miles from north to south and 350 from east to west. On the north it borders the Libyan desert and Dongola Province, on the east Kordofan; on the south the Bahr el-Ghazal Province; on the west Wadai. The original Fur inhabitants are mostly in the west and clustering round the Jebel Marra; the Arab element predominates elsewhere. It is a turbulent land of many feuds, with wild lawless tribes, the Bedaiat and Guraan, on the frontiers, who throughout this period have almost unceasingly harried their Kordofan

neighbours (particularly the Kababish and Hawawir). Others of its tribes have from time to time attempted to migrate *en masse* into Sudanese territory to secure better treatment, as did the Maalia and Zayada in 1904. The Arbain (or Forty Days) road through the desert by Bir Natrun to Upper Egypt at Assiut has been the constant scene of depredations by raiders from Darfur, and the Sudan Government's efforts from 1905-8 to keep this trade route open (from 1884-1905 it was always unsafe) were not very successful. The land was ruled by Ali Dinar, a youthful grandson of Sultan Mohammed Fadl (who reigned 1801-39), who, escaping from captivity at Omdurman in 1898, was recognized as Sultan at the end of 1899. He paid regularly from 1901 a small annual tribute of £E500 to Khartoum and received occasional advice and instructions. For the most part he was left alone to go his own way. During his reign his will was sole law in the country. He gradually accumulated a large store of arms, including 6,000 rifles, mostly smuggled over the French border, and gathered half the entire wealth of the country into his own possession. His religious zeal was fervent; his harem large. From time to time tribes and sheikhs defied him, and were suppressed with more or less success. Musa Madibbo, however, sheikh of the Rizeigat Arabs in the south of Darfur, always maintained his independence and harboured refugees from Ali Dinar's extortions. At the end, 1915-16, this sheikh proved useful to the Sudan Government. The French soon after their occupation of Wadai became involved in disputes with the Sultan concerning the border districts of Dar Tama and Dar Masalit, and the Sudan Government intervened in the matter. The French proposals in 1913 were unacceptable, but the question was on the high road to settlement by arbitration at The Hague when the outbreak of the European War next year interrupted the negotiations. In that war Ali Dinar, corrupted by letters from Enver Pasha in February 1915, by a Turkish decoration in August 1915, and by gifts of arms from the Senussi in March 1916, renounced his allegiance and prepared to invade Kordofan and Upper

Egypt in co-operation with the Senussi invasion from Sollum and Siwa. In March 1916 a punitive expedition was sent against him which marched from El-Nahud in Kordofan on the Sultan's capital El-Fasher. The Darfur army of 3,500 men was routed at Beringa, and the capital was occupied on May 23. The Sultan fled to Jebel Marra. In September the advance was resumed and finally Ali Dinar was surprised in his camp at Giuba, 30 miles south-west of Kulme, on November 6, 1916, and shot dead as he fled. His last adherents surrendered on November 23. Darfur was then incorporated into the Sudan. Co-operation with a French column against the lawless frontier tribes in December 1916 speedily followed. The country is still largely unexplored and unmapped, and its frontiers are not yet delimited.

In 1919 the boundaries between the British and French spheres of influence were further defined by a Convention supplementary to the Declaration of 1899 (see p. 168).

#### *Administrative Arrangements*

The Sudan on its reoccupation was divided into ten provinces and districts,<sup>1</sup> viz. Halfa, Dongola, Khartoum, Berber, Kassala, Suakin (called Red Sea Province from 1906), Kordofan, Fashoda (called Upper Nile Province from 1903), Sennar, and Bahr el-Ghazal. Later readjustments added four, viz.: Blue Nile (formed out of Khartoum Province in June 1902, and named Gezira Province 1902-January 1, 1905); White Nile (formed January 1, 1905, of districts taken from Blue Nile and Kordofan); Mongalla (created in 1906, consisting of the southern portion of Upper Nile); and Nuba Mountains (the southern portion of Kordofan, separated from this for administrative purposes as from January 1, 1913, and for financial also from January 1, 1914). Darfur was annexed in 1916. Sobat-Pibor Military District was separated as such from Mongalla in 1912. The total number of provinces is now 15 with one Military District. Various readjustments of provincial boundaries have also been made from

<sup>1</sup> This early distinction is immaterial.

time to time, and some changes made in the assignation of tribes to one or other. Some tribes are distributed over two or more provinces. The actual delimitation of provincial boundaries has been steadily in progress, but is not yet in all cases completed.

*The Eritrean Frontier.*—A long series of agreements and other documents has defined the Sudan-Eritrean frontier from Ras Kasar on the Red Sea coast to Umbraga on the Setit River. The work of survey and delimitation is now all but complete. A commission of Dec. 1915–Jan. 1916 surveyed the section farthest south. There were also concluded between the two countries Customs (Nov. 26, 1901), Postal (Jan. 8, 1902), and Telegraphic (Jan. 8, 1902) Conventions.

Neither on the Eritrean nor on the Abyssinian border does the political coincide with the ethnic frontier. The large nomad tribe of the Beni Amer on the former, the Anuak on the latter, are divided between the Sudan and its neighbour. In both cases this has led to difficulties. On the Eritrean frontier the nomad of sheer necessity has to move his flocks and herds from pasturage to pasturage according to the season of the year, and thus to come down every autumn from the Eritrean hills to the Kassala and Atbara plains. The problem has been also complicated by the constant recurrence of cattle disease in Eritrea. Full liberty of action to permit or prohibit such migrations was reserved to themselves by both Governments in the Sabderat Agreement of Feb. 28, 1901, which superseded earlier arrangements of 1895 and 1898. At present such migrations are discouraged. Both in this matter and in the question of the utilization of the waters of the Gash for storage and irrigation purposes (one of great importance to Kassala) the goodwill of the Italian authorities and border officers has never been lacking. Relations with Eritrea throughout the period have been most friendly, and, save for spasmodic acts of brigandage, the peace of the frontier has been undisturbed.

*The Abyssinian Frontier.*—A treaty with Ethiopia of May 15, 1902, defined the frontier between Abyssinia and the Sudan,

and gave the latter certain trade facilities and railway concessions. Of the last no use has been made or is likely to be made. They were but a by-product of the then popular 'Cape to Cairo' idea. For trade purposes a block of territory was leased to the Sudan at Itang on the Baro, for which in 1904 Gambella was substituted. Hence a road runs to Addis Abeba, and here, too, is the only wireless station in Abyssinia. More than three-quarters of the total Sudan trade with Abyssinia passes through Gambella. To the Sudan, as to Egypt, the water contributed to the Nile by the rivers rising in Abyssinia, the Blue Nile, Sobat, and their tributaries, is of vital importance. The same treaty therefore forbade the construction of any work across the Blue Nile, Sobat, or Lake Tsana, which might arrest the flow of their waters into the Nile, except by agreement with the Governments of Great Britain and the Sudan. This clause has been duly observed, and no such work attempted. The idea of a regulating barrage at the lake led to the dispatch in 1915 of a joint mission of inquiry by agreement with the Abyssinian Government, but local obstruction prevented any great result of the 'Lake Tsana Mission', which returned to the Sudan early in 1916. The actual frontier from the Setit on the north to lat. 6° N. on the south has been (in 1903 and 1909) partially surveyed, but from the Sobat to Lake Rudolf it is still provisional and not fully explored. Except where it follows the course of a river, it cannot be said to be in any sense delimited.

Slave-raiding, slave smuggling, arms smuggling, ivory poaching, have all contributed since 1899 to keep this frontier in a most disturbed condition. The Abyssinian Central Government has at no time exercised any effective control over the marauding tribes on its side of the frontier, nor, save in the rarest instances (as in 1904), has it co-operated with the Sudan authorities to suppress or punish raiders and smugglers, or offered on more than one or two occasions (as in 1909) even a tardy redress for part of the damage wrought by its subjects. Since the abdication of the Emperor Menelik in 1910 it has not even attempted any maintenance of order on its borders



or co-operation with the Sudan to this end. The Abyssinian border officials throughout have been worse than useless. The tribes of the south-eastern Sudan, the Nuer, Beir, Berta, and Burun in chief, have suffered constant raids by the Galla, Anuak, and other Abyssinian highlanders. To check the evil the Sudan has been thrown of late years entirely on its own resources. The Jebel Jerok punitive expedition of 1904 had some Abyssinian help in suppressing the slave raiders under Ibrahim Wad Mahmud and hanging their leader. From 1907 to 1912, raids from over the frontier, as on Gezan, Jebel Kashangaru, Jebel Faronge, &c., were of annual occurrence. Vigilance patrols have constantly to intercept the *jellaba* or merchants who smuggle slaves over the border into the Sudan. Since 1911 the smuggling of arms and ammunition has been a still greater evil, which affects Uganda as well as the Sudan. The Anuak are said to have acquired 25,000 rifles in this year, and the Sudanese tribes from the border as far as the Bahr el-Jebel have learnt to purchase rifles from Abyssinian merchants by illicit trade in ivory. These pugnacious, and to some extent little known, tribes of the south-eastern Sudan and of the Uganda border have hence been able to indulge in their favourite pursuit of intertribal feuds with greatly increased ferocity and loss of life. From 1912 to 1917 there has been constant fighting among themselves of the Anuak (part of this tribe belongs to the Sudan), Nuer, Beir, Burun, and Dinka peoples, and a succession of punitive patrols has had to be despatched. Over a large part of the south-eastern Sudan security of life and the maintenance of order have been uninterruptedly menaced. So great was the burden on Mongalla province that a new Sobat-Pibor Military District, with an area of 24,400 square miles, was carved out of it in 1912, and a complete battalion was assigned to it. Military posts were fortified at Nasser, Akobo, Bonjak, Pibor, and, in 1917, at Nyerol. Bonjak has now been abandoned, but a post was established in April 1920 in the Gargwang Nuer country on the borders of the Garjak Nuer country. Others are urgently needed on the Boma plateau

and in the Garjak Nuer district. The land beyond the border remains always a hospitable Alsatia for all marauders.

*The Uganda Frontier.*—Up to December 31, 1913, the 5th parallel of N. latitude was the frontier between the Sudan and Uganda, Mongalla, on the Bahr el-Jebel, being the most southerly place belonging to the former, Gandokoro, the most northerly, belonging to the latter. When in 1910 the Sudan acquired the Lado Enclave, the left bank of the Nile for some 200 miles belonged to it, the right bank to Uganda.

As a result of a joint commission in 1913 the whole frontier was readjusted by a large exchange of territory, the Sudan giving up 4,700 square miles and receiving 17,000 (much of this unexplored and marsh land). On the river Dufile was fixed as the northernmost Uganda station, Nimule as the most southerly Sudan port (save for a small enclave to the south of it to serve as a port on the navigable stretch of water between Dufile and Lake Albert). From Nimule the frontier runs east to Lake Rudolf, west to the Nile-Congo Divide and the Belgian frontier. Most of it has not yet been surveyed, and the whole is at present provisional only. By this exchange the Madi, Lugwari and Alur tribes belong to Uganda, the Bari (hitherto divided), Toposa, and Latuka tribes to the Sudan.

Exploration and, lagging behind it, administration have since January 1, 1914, been gradually pushed eastwards from the river to the Lafit, Lokoya, Imatong, and Dongatolo hills (1914-16). Sultan Lokidi of the Latuka people offered opposition at Tarangole, and was killed in battle in June 1917. The tribes to the east of this place are still little known. On the outbreak of the European War the tribes on the Sudan side of the new frontier raided over the border, and, at the request of the Uganda Government, Sudan troops from Mongalla temporarily patrolled the northern strip of Uganda territory. The Sudan also sent a contingent to the Turkana Expedition on the west of Lake Rudolf in 1915. Uganda has now resumed the administration of her own northern territory. Much fighting took place in 1917 with the Turkana on the frontier

north of the Laburr Mountains, these being assisted by disciplined bodies of Abyssinian riflemen raiding from the Keibesh River.

### *Religious Fanaticism*

Neither the death of the Mahdi nor the overthrow of the Khalifa completely destroyed the belief in the former's divine mission prevalent in the northern Sudan. From 1899 continuously the recrudescence of fanaticism was a possible peril. To it the Arabs of the Gezira and the Baqqara of Kordofan were always liable. To the former was due the one really dangerous outbreak of these years, the 'Katfia Rising' of 1908. The latter were found still paying surreptitious visits to the Khalifa's grave in 1915 (a complete justification of the destruction of the Mahdi's tomb at Omdurman in 1898). In the years 1901-16 a dozen or more religious fanatics, secretly or openly hostile, excited attention. The career of the original Mahdi emphasized the importance of the *Obsta principiis* maxim, which has throughout determined the action taken in these cases by the Sudan Government. Thanks to this only the 1908 outbreak caused disturbance of any long duration or involved the loss of English life.

The summary list of these fanatics is as follows :

In February 1901 *Ali Abdul Kerim* in Khartoum province claimed to be the Mahdi. He was arrested and imprisoned.

In autumn 1902 *Mohammed el-Amin* of Bornu declared himself the Mahdi in Kordofan, on his return journey from Mecca. He was captured at Dar Gimma and executed at El-Obeid.

In 1904 *Mohammed Adam* declared himself the prophet Isa (i. e. Jesus<sup>1</sup>) at Singa in Sennar province. He was killed in a skirmish.

In April 1908 *Abdul Kadir*, an old pardoned Mahdist, rebelled in the Mesellemia district of Blue Nile province, the

<sup>1</sup> In the tenets of all Moslem sects there is a close connexion between Jesus and the Mahdi in relation to the second Advent. This belief (in various shapes) is based on 'The Traditions', not on the Koran.

chief home of fanaticism in the Soudan. He preached a holy war, murdered an English official<sup>1</sup> at Tugr village, and attacked a punitive force at Katfia. In May he was captured, tried, and hanged. The unrest spread to the White Nile province, and took many months to die out. *Abdel Bagi*, one of his adherents, escaped arrest until April 1914, when, after stout resistance, he was taken, and died of wounds soon after.

In 1908 *Abu Howara*, a 'fiki', proclaimed the immediate advent of Isa at Burdia in Kordofan. He was arrested and discredited.

In 1908 *Abdel Wahab* and other Mahdist fikis in Dongola province were detected in plots against the Government.

In 1910 *Hashmi*, who declared himself the Sahib el-Wakt (Master of the Times), and his sons gave trouble at Kitiab village in Berber province. He was arrested and hanged for murder.

In 1910 a fiki among the Shenabla in White Nile province, claimed to be the prophet Isa. He was killed in a fracas with the local police.

In 1910 a 'Mahdi' arrested at Abba Island in the same province proved to be a deserter from the ninth Sudanese battalion.

In 1910 *Nigma el-Din*, a fiki, used the excitement caused by Halley's Comet, the 'Mahdi's Star', to cause a disturbance at two villages of Taaisha (the Khalifa's old tribe) in Sennar province. He eluded arrest and caused fresh trouble in three Fellata villages south of Sennar next year. He again escaped and thus justified his claim to 'invisibility at pleasure'.

In 1912 *Akasha Ahmed*, a fiki, one of Abdul Kadir's old adherents in 1908, claimed to be the prophet Isa at Jebel Gedir in the Nuba Mountains (scene of the Mahdi's 'Hegira' in 1881). He was killed in fighting.

In 1915 *Ahmed Omar*, a Fellata from Sokoto, declared himself the prophet Isa also at Jebel Gedir, and called on the Fellata villagers of the district to join him. They remained

<sup>1</sup> Mr. C. C. Scott-Moncrieff.

quiet, and he and his small band of followers were slain in attacking the local police.

In Jan. 1916 a youth in Halfa province declared himself the destined ruler of the world and attracted adherents. He was suppressed.

The number of these fanatics, petty as many of their 'risings' seem, justifies the unsleeping vigilance of the Government and the prompt action taken in every case by the local authorities. (See Appendix I for later fanatics).

### *Slave-Raiding*

Under the old Egyptian Government energetic European administrators, such as Gordon and Gessi, had waged tireless war on the slave-trade. They were supported by Khedivial proclamations, baffled and opposed by all local officials of every grade. Their efforts rather diverted than arrested the current of the traffic. The Dervishes, when masters of the Sudan, stimulated the trade by every possible method. Hence on the reconquest of the country the new Government found itself at once face to face with the whole problem of slavery anew. It was no easy one to solve.

For slavery was an ancient custom deeply rooted in the lives of the inhabitants, fully authorized by Mohammedan law, and popular with all classes except the slaves themselves. To the cultivator it was the basis of society. All labour in the fields was performed by slaves. To the nomad the slave seemed equally indispensable for the tending of his flocks and herds. The abolition of slavery might seem to involve the whole free population of the northern Sudan in beggary and ruin. It certainly would provoke lively, possibly dangerous, discontent among every section of the Arab population. The Baqqara had hastened to join the Mahdi for this very reason not long before, and the fear of a 'Mahdist' rising was ever present in the thoughts of the new Government.

The essential abolition of slavery was nevertheless the only possible principle of action. From the first a clear distinction as regards immediate action was drawn between the slave-

trade and domestic slavery as an existing institution. Gordon himself had been compelled officially to recognize such a distinction.<sup>1</sup> While the trade in slaves became the object of immediate efforts at repression, the abolition of domestic slavery was left to the effectual working of more indirect methods and to the operation of time. All slavery was declared illegal. But no proclamation of the immediate emancipation of slaves was issued.

The Agreement of January 19, 1899, declared that 'the importation of slaves into the Sudan as also their exportation is absolutely prohibited'. In 1902 the Slavery Repression Department was reorganized, and remained under the control and direction of the Ministry of the Interior at Cairo until January 1, 1911. During these nine years it worked vigorously to suppress the whole traffic in slaves, while leaving the question of the status and emancipation of those already in domestic slavery within the country to the Sudan authorities. English inspectors and mounted patrols were stationed on the frontiers (especially the Abyssinian and Kordofan-Darfur), patrol boats policed the Red Sea, Port Sudan and Suakin harbours were closely watched. Captured slaves were liberated (their repatriation, except in isolated cases, was hardly possible), and the traders were punished by imprisonment. In 1911 the Governor in Upper Nile Province reported that slave-raiding had 'entirely ceased' in his province, and in Bahr el-Ghazal province that 'the decrease of the slave-trade in the last few years is extraordinary'. From January 1, 1911, the Slavery Repression Department was transferred to the direct control of the Sudan Government. Several slave-caravans were in this year intercepted in Sennar Province, and as late as 1915 one such was captured on the Bahr el-Arab. The extension of the railway to El-Obeid in 1911, and the French effective occupation of Wadai, greatly checked the secret importation of slaves into Kordofan and the western Bahr

<sup>1</sup> Cf. his proclamation of February 18, 1884, at Khartoum (see p. 161), which caused much excitement among those at home who made no effort to understand the realities of the problem.

el-Ghazal, and the annexation of Darfur in 1916 is likely to complete the work of suppression. On the Abyssinian border the danger of the importation of slaves and of raiding the country for slaves is by no means at an end.

While slave-caravans are thus now a past evil, the kidnapping of women and children for sale overseas is not entirely ended. This has always existed and is most hard to detect. The merchants (*jellaba*) make such large profits from the sales that they are willing to run many risks. In the early years of the new Government the practice was rife. It was, e.g. discovered in Dongola province in 1902 and 1903; in Kordofan in 1902; in Blue Nile province in 1903; at Suakin in 1902; in Kassala province in 1904 and 1906 (the Gemilab Arabs being persistent offenders); in Upper Nile Province in 1911; and in 1917 Fellata pilgrims to the Hejaz were found to be smuggling their own and Sudanese children across the Red Sea to be sold at high prices. Official vigilance has reduced the evil to small dimensions, by a system of passes, and by the organization of the Slavery police in Darfur, on the Red Sea littoral and on the Abyssinian frontier.

#### *Inter-tribal disturbances*

Unrest due to other causes has from time to time prevailed in various provinces.

In Dongola the tribes of the far western deserts and the Arbain road have been constantly harried by Bedaiat raids from Darfur. The Hawawir tribe has given trouble and refused to pay tribute, but in 1917 it was assigned to Kordofan.

In Fung (ex Sennar) Province petty feud always exists. In the Tabi Hills and further South there were disturbances in 1908, -10, -17, -18, and -19.

In Mongalla when administration was confined to a narrow area near the river, there were raids of the Beir on the Dinka. A strong patrol tamed them in 1912. Recently to the east of the river the Turkana Dodinga and outlaws have caused trouble. To the west of the river, the Aliab Dinka rose

against the Government in 1919. A patrol restored order in spring 1920.

In Kordofan the inter-tribal feuds of the Kababish and Beni Gerrar or Kawahla, the Hawayina, Meseria, &c., have practically died out ; though in the extreme north-west raids of Bedaiat and Guraan occasionally provoke reprisals from the camel-raising tribes.

The Nuba Mountains have been and remain constantly disturbed. The Nuba inhabitants, persecuted remorselessly by the Dervishes, have lasting feuds with the Arabs, and equally among themselves, and, trusting in their well-nigh impregnable and inaccessible rocky mountain fastnesses, honeycombed with galleries and caves, remain distrustful and often defiant of Government, a traditional hostility reaching back to the days of Mehemet Ali. The mountaineers are armed with rifles, mostly still guerrisable Remingtons captured from Hicks Pasha. Scarcely a year has passed without some disturbance with these hillmen, who enjoy a fight and are now continually taunted by their own women with 'not being the men their fathers were'. Hence the history of the period is that of one series of punitive patrols to different Jebels to enforce, if possible, maintenance of order, and the authority of, and respect for, Government. The years 1908-10 and 1914-17 were especially full of such expeditions, the restlessness of the latter years being certainly in part a reflex of the alarmist rumours concerning the situation in Egypt provoked by the European War. The list of such disturbances and patrol visits (often accompanied by stubborn if brief fighting, in which at times Arab sufferers from Nuba depredations have willingly co-operated with the Government police and troops) includes those at Jebels Buram (1908, 1917); Dagig (1910, 1913), Heiban (1911), Krongo Bakhait (1911), Tagoi (1910, 1911), Tira el-Akhdar (1914, 1915), Alira and Koalib (1919), all in Talodi district; Daier (1904); Eliri (1906), Nying Nying (1906), Katla Karum (1910); Shat el-Safia (1904), Moril (1905), and other hills in Kadugli district (1913), and in Dilling district, the worst of all, Dulman (1914); Fanda



(1908); Kadaro (1906); Katla Kidu (1908, 1909); Mandal (1904, 1914); Sabei (1914); Tima (1909, 1910); and Nyima, the most formidable hill group (1906, 1908, 1914, 1916, 1917).

The history of Upper Nile Province is mainly that of the Shilluk, Dinka, and Nuer peoples, and the Government's relations with them. The Shilluk have given little trouble. Mek Yor, deposed in 1903, was removed to Wadi Halfa. His successor, Mek Fadiat, was loyal to his death on Feb. 6, 1917. A bare majority of the votes of the five tribal chiefs, amid much excitement, elected Mek Farfidi; only the presence of a Government force prevented bloodshed. Small Shilluk disturbances occurred in 1911, in 1915, and in 1916. The Dinka have been quarrelsome and lazy, especially the Khor Filus Dinka, who had to be compelled to pay their herd-tax in 1909. The Nuer, who are half the population and occupy half the province, have from the first been a difficult problem, the despair of the Governor, and still so remain. Savage, warlike, and suspicious, they have fought continually among themselves and with their neighbours. The Gaweir Nuer on the Bahr el-Zeraf gave much trouble in 1913 and 1914, but in 1916 paid their tribute. Punitive patrols were sent against the Lau and the Garjak Nuer in 1917, and against the Gargwang and Garjak Nuer in 1919. The latter patrol went a long way towards solving the problem of administration.

In Bahr el-Ghazal the Egyptian flag was hoisted at Meshra el-Rek in September 1898, but a military force first reached the place on December 13, 1900. In June 1901 Sultan Tembura on the Nile-Congo Divide was visited. In 1902 military posts were established at Wau, Tonj, Rumbek, Shambe, and elsewhere, and a civil administration replaced the purely military occupation. By an Ordinance of February 7, 1907, the Sudan Codes were first applied to the province.

The eastern district has throughout called for much attention owing to the unruliness of its Dinka and Nuer inhabitants. The Gok and Shish Dinka have been peaceable, the Agar and Atwot very much the reverse. In 1901 the Agar Dinka

murdered a British officer <sup>1</sup> and were punished. They remained unfriendly in 1916. The Atwot Dinka on Lau River and their chief Ashwol (Loitch section), have been continuously hostile from 1903, and quarrel also freely among themselves. Punitive expeditions in 1907 and 1910 and a visit of the chief to Khartoum in 1911 made no lasting impression. In 1917 he was still at large defying the Government, and the Atwot attacked a Government post at Gnopp. In 1918 a patrol restored order. In 1914-15 the Nuer raided the Dinka who, assisted by a small police force, utterly defeated them.

In the central district the old question of grazing rights on the Bahr el-Arab has led to continual quarrels between the Dinka of the north of the province and the Rizeigat Arabs from Darfur. In 1908 Dinka attacked Arabs (a novel venture on the part of a negro tribe); in 1909 the Arabs retaliated, and Nyamlel post was afterwards established to protect the Dinka. Arbitration in 1912 had some success. In 1914 the Dinka raided the Golo on the Wau-Chak Chak road. In 1915 the Rizeigat again returned to the attack. In 1917 the Dinka were still restless and fractious; the Miar Amet Dinka were punished for lawlessness. Dinka near Nyamlell attacked police in 1920.

The western, Moslem, district remains largely unadministered. There is much smuggling of arms. There are numerous petty tribes, each with its Sultan. In 1907 district head-quarters were moved from Dem Zubeir to Raga, and in March 1916 a regular garrison was placed at Kafiakingi. There was a Mandala raid in 1914 on the pilgrims' way hence to Abu Gabra. Streams of Fellata pilgrims pass along it. A Mandala raid (1919) on Raja was heavily punished by the people of the district.

The Zande tribes of the Nile-Congo Divide, a fine folk, are now well in hand. Sultan Yambio and his son Mangi were hostile in 1903-4, and were attacked in 1905, when the Sultan died of wounds. Mangi made submission and remained quiet till 1914, when he broke out again and was deported to Khartoum, where he died in February 1916. There were other

<sup>1</sup> Lieut. Scott-Barbour.

disturbances to the peace in the Yambio District in 1914, and a secret orgiastic Society, the Bir, gave anxiety here in 1916 and 1917, which is now somewhat allayed. A small mutiny in a company of the newly raised Equatorial Sudanese battalion belonging to the district was easily arrested in 1914. Sultan Tembura, on the other hand, was consistently friendly from the time of the 'Mission' to his district in June 1904 to his death in March 1914, when he was succeeded by Renzi his son.

*Summary of Progress : the European War*

Less than 20 years have passed since the reconquest of the Sudan. In this short space of time much progress has been made. There have been instituted systems of administration, both central and local, of jurisdiction, of education, and a civil service. Peace has been secured and order maintained. Fanatical outbreaks have been instantly checked. Slave raiding has been almost entirely suppressed. No enemy has attacked from outside. The rebel Sultan of Darfur has been slain and his country annexed. Intertribal warfare has been greatly diminished. Friendly relations have been constantly maintained with neighbouring administrations. The administration has not yet fully penetrated to the southern and western extremities of the country and the state of the Abyssinian frontier is one of constant unrest, so that the work of pacification is not yet fully complete. But by far the greater part of the Sudan is now a land at rest. The result is seen in the steady economic and material development of the country. The land under cultivation has increased, thanks to Government measures of encouragement, of precaution against alienation, of experiment, and especially of irrigation. The food supply has been increased, and famines, even in bad years, no longer decimate the land. The population had risen from under 2 millions in 1906 to nearly 3½ millions in 1917. Towns have grown in size. Villages have been rebuilt or newly established. Livestock has increased and is carefully guarded against infection. Sanitation, prophylaxis, and research have improved health and combated disease in man,

animals, and plants. The revenue has increased year by year. Gum and cotton, the most valuable native products, have received unremitting official attention. Due precautions are enforced for game and forest preservation. Communications by rail, river, and road have been persistently bettered and increased. Perhaps for the first time in the whole history of the country a man's life is now secure against violence, and his property against injustice and extortion.

Much work remains to be done, but the experience of the years 1898-1917 suggests no change of method or temper of the administration. The needs of the Sudan are obvious. Capital is wanted for many schemes. Labour is hard to find; for Arab dignity is the product of many generations accustomed to the mastery of slaves, and negro inertia is content with a minimum of comfort if it may enjoy repose. Education may be widely extended. Economic development lags far behind its possibilities. But progress in all respects has been far more rapid than was believed possible in the early days of the period, and there is no room in the Sudan for impatience or ill-considered haste.

The final test of fifteen years' or more work came with the outbreak of the European War, and especially Turkey's share in it, at the end of 1914. The loyalty of the Arabs, the quiet of the negroes, might then well have been shaken. Both were rooted in content and stood firm. Martial law was re-affirmed at Khartoum on November 14, 1914; and an emissary from Enver Pasha sent to tamper with the officers of the army was captured at Port Sudan. Neither this nor the declaration of the British Protectorate over Egypt on December 18, 1914, caused any excitement. The threat of invasion to Egypt both from east and west produced a crop of alarmist rumours, but no open disaffection save in Darfur, and the peril passed away. Memories of former 'Turkish' iniquities in the land were still lively. The religious authorities, the Ulema of Khartoum and through the country, always sympathetically treated, honoured, and consulted by the Government, had no interest in any holy war on behalf of the Sultan of Turkey or a traitorous and deposed Khedive of Egypt.

## CHAPTER V

### POPULATION <sup>1</sup>

Northern population (Arabs; Hamites (Beja); Divisions of the Beja; Barabra or Nubians)—Southern population (Nilotes; Azande and kindred tribes; Nuba; Traces of negrito blood; Fung and Hameg, Burun).

THE population of the Anglo-Egyptian Sudan is mixed in blood, but presents two ethnographical zones sharply marked off from one another: (1) the population of the dry regions in the north, Mohammedan in religion and culture, mainly Arab in language and to a large extent in varying degree of Arab origin; (2) the population of the well-watered regions in the south, belonging predominantly to the primitive negro culture, and negroid in language and race.

These ethnographical zones are not clearly defined by any line of latitude. In the west Mohammedan influence has extended over the comparatively dry western district of the Bahr el-Ghazal Province south of lat. 8° S., and on the east it reaches up the Blue Nile almost to the Abyssinian frontier; while in the centre the negro population extends much farther north along the White Nile, and the Nuba mountains in southern Kordofan form an enclave of purely negroid culture and population.

#### NORTHERN POPULATION

The northern zone, though one in culture and almost entirely Arabic in language, has no true ethnical unity. Centuries of foreign conquest, tribal migrations, and above all slavery, have led to scarcely any pure stock surviving.

<sup>1</sup> For figures of population, see p. 283. Throughout this chapter an effort is made to give the correct forms of Arab and other tribal names; the more conventional forms are given, if at all, in parentheses.

Arab and Hamite, Hamite and negro, above all negro and Arab, are found in every degree of crossing and every shade of colour. The Arabs have, however, succeeded in impressing their language, civilization, and character on practically all the peoples with whom they have been brought in contact, and the consequent Arabization of the northern and central Sudan, has gone a long way, although it only began in comparatively modern times, towards welding their inhabitants into one people.

In the earliest period of Egyptian history the Nile valley above the Second Cataract was inhabited by a negroid race, while the steppes to the east were no doubt occupied then, as now, by nomad Hamitic tribes. During the second millenium before Christ, and especially under the nineteenth dynasty, the whole of Nubia was completely Egyptianized in culture and religion, and the Egyptian element became dominant in the population. Thus the first Ethiopian kingdom, which conquered Egypt itself, was thoroughly Egyptian in character, however mixed the bulk of the population may have been. The subsequent racial history of Nubia is obscure ; but apparently the Hamitic element greatly increased and was the preponderant element in the later Meroitic kingdom. There is no reason to doubt that the Christian Nubians of the kingdom of Dongola were substantially identical in race with the modern Nubians or Barabra. It was only in the later Middle Ages when the Christian kingdoms of the Nile valley succumbed before the attacks of the nomad Arabs in the north, and of the Arabs and negroes in the south, that the Arabization of the Sudan really began.

#### ARABS

Arab is a name of such wide denotation in the Sudan that it covers many stocks in which the actual infusion of Arab blood may be very slight indeed. ' Arab ' is regarded as a term of honour, and there has been a tendency on the part of tribes quite distinctively Hamite, Nubian, or negroid in their main characteristics to claim Arab origin, basing this claim

in part on oral tradition and in part on genealogies largely fictitious. The wandering *fiki* is usually ready, if well paid, to compose such a genealogy showing unbroken descent from the family or relatives of the Prophet, and to believe in such a genealogy then becomes an article of faith. Language, never an unfailing criterion of race, is also quite inadequate to determine Arab descent, as Arabic may either have suppressed an original tongue altogether or driven it into a subordinate position, as among many Nubian, Fur, and even negro peoples. At the same time it must not be overlooked that in the case of certain nomad tribes, especially in Kordofan and the southern Gezira, the term Arab is more properly employed to denote a people who, in physical characteristics, mode of life and speech, belong distinctly to the Arab race rather than to any other.

The Arabs are said to have entered the Sudan at different periods and from two different directions, viz. westwards across the Red Sea and southwards from Fezzan and Egypt. It is, however, pointless to make these different migrations the basis of an ethnological classification. The only satisfactory classification is the practical one used by the Arabs themselves, viz. :

1. Ahl Ibl (or Badia), or people of the camel ; nomads.
2. Baqqara (Baggara), or cattle folk ; mainly nomads.
3. (i) Ahl Sawaki, or people of the *sakia* ; riverain cultivators.

(ii) Other sedentary villagers.

These classes are not mutually exclusive. Some tribes (as the Kenana) include all three ; some (as the Sha'iqia, Shukria, Hamar, Hassania) are both nomad and sedentary. A sedentary (particularly at certain times of the year) may be some distance from a nomad section of the same tribe. Again, the same section may be nomadic at one season of the year and sedentary at another. The distinction, however, between camel-owners and cattle-owners is a good working one and largely geographically determined ; for camels should not be taken south of lat. 13° N., and the camel-owning true nomads

(who also keep many cattle) range the deserts far and wide north of this ; whereas the Baqqara, whose wealth consists in cattle, pasture their animals in the well-watered luxuriant country south of lat. 13° N. as far as the Bahr el-Arab mainly on the left bank of the White Nile, and thence west to Darfur and Lake Chad.

The sedentary villagers, although many are true Arabs with light skins and good features, are, generally speaking, the least typical and the least pure in blood, and are rather looked down upon by the nomads unless, as often occurs, they belong to some ' holy ' family.

The tribe is under the control of a head sheikh. The office is normally hereditary, but is sometimes elective. There is a tendency for the larger tribes to become lacking in cohesion, and for the different sections to become independent, as has happened, for instance, with the Dar Hamid.

Certain tribes (such as the Kababish) have preserved a great part of their old nomadic traditions and organization. In such the head sheikh carries with him his *nahas*, the war drum of the tribe, as the symbol of his supreme authority, and ceremonies are observed in moving from place to place.

Each section (*khasham-beit*) of a nomad tribe is under its own sheikh, and pitches its camp slightly apart from the other sections ; but all acknowledge the ultimate authority of the head sheikh. He is usually referred to as El-Sheikh, the word Omda not being commonly used, and the official title Nazir being a foreign importation.

Among the sedentary population tribal organization is very much weaker, though importance is still attached to the tribal pedigree (*nisba*). A communal organization tends to take the place of that of the tribe, the village being under a sheikh and the group of villages under the control of an omda.

Important sheikhs may possess cultivated lands, as well as a house in Omdurman or some lesser town. Their influence depends not only on wealth and character, but even more on the nobility and holiness of their descent.

The camel-owning nomads, generally speaking, range the



steppes west of the main Nile and east of the Blue Nile, and the south side of the Gezira. Of all so-called Arabs they have the least intermixture of non-Arab blood, and many have reasonable claim to descent from the best-known tribes of Arabia. They move into the lands of the sedentary villagers only when their water supply and grazing are exhausted. The following is an account of their movements :

(a) *Those West of the Nile*.—These spend the dry season roughly along the line of lat.  $14^{\circ}$  N. When the rains break (July) they move north and north-west to where the country is cleaner, and there is fresh grass and large pools form. They stay there till about the end of the year (November) when the water has (generally speaking) dried up, and then move back to where they started from. The chief exception to this tendency is provided by the Kababish who send many of their camels and sheep to the *gizzu* north of Meidob till about February.

(b) *Those East of the Blue Nile and Gezira*.—These spend the dry season within reach of the Nile or well-centres. When the rains fall (July) they move east or north-east, as the case may be, to the Butana or to the Blue Nile Province—Kassala border, so long as grass and water (in *hafirs*) last. Then back again.

The Baqqara (Baggara) is a generic not a tribal name, and is applied to all tribes which primarily breed cattle (*Baqqar* = 'ox'). The Baqqara, however, form a real social unity. They occupy the comparatively well-watered plains of southern Kordofan and Dufur between lat.  $13^{\circ}$  N. and the Bahr el-Arab. They are nomadic within the limits required by seasonal changes, pasturages, and the need for water. Their enormous herds of animals can go anywhere in the southern Sudan except in those areas where the tsetse fly is prevalent. The Baqqara own many horses, but on their migrations carry their baggage on bulls, which are extremely docile when trained, and carry loads of from 200 to 300 lb.

In former times the Baqqara were keen slave hunters and cattle raiders and stout fighters, and may still perhaps be

regarded as the most warlike people in the western Sudan. They are extremely independent, and the several sub-tribes entertain a good deal of distrust of each other.

The life of the nomad tribes whether camel- or cattle-owning depends above all on the supply of water and pasturage for their live-stock. The ownership of wells is jealously prized and often gives rise to inter-tribal disputes. Life on the gizzu or winter grass, on which the animals west of the Nile can subsist entirely without water for two or three months, is a hard one for the herdsmen. The cold is severe ; there is no fuel and no cover ; camel's milk is the chief food ; but the pleasure of seeing the animals put on flesh outweighs these discomforts.

Physically the nomad Arab, especially in northern Kordofan, is a fine type. Where there is little mixture of negro blood he has a fine head, oval face, sinewy limbs, and erect athletic carriage ; his expression is keen. The skin colour varies enormously according to purity of race. In general features many Arabs are often not dissimilar from the 'Hamite', but, except in the case of the Baqqara youth, the Arab does not 'dress' his hair, but shaves it according to Arab custom. The Baqqara are, as a rule, darker in colour than the northern nomads, being to a considerable extent of negroid strain.

*Character.*—The Arab of the Sudan, who has in varying degrees the blood and tradition of the pure Arab race, is proud, tenacious, and intelligent, although curiously inappreciative of time, not generally well educated, and prone to bigotry. He is certainly far superior to the indigenous races in mental power. His demands on life, his initiative, his commercial instincts and business aptitudes carry him beyond the mere provision of necessities with which the negroid peoples remain content. Belonging to a race of warriors, hunters, hardy herdsmen, and daring commercial adventurers, he is bold and enterprising. Never purposelessly cruel, he is utterly callous. Occasionally he furnishes examples of high intellectual and spiritual power. He is apt to be litigious and is a born casuist. His imaginative

power, which finds its principal expression in his religion, affords him escape from the hardness of much of the reality that surrounds him. He is docile to the teachings of his religion with which is certainly connected in him an undercurrent of fanaticism. His morality is prescribed by his religion, and in the case of vast numbers there is little inherent morality, while the doctrine of fatalism no doubt works injuriously in the Sudan, as everywhere in the Mohammedan world.

Perhaps the Arab's most invariable characteristic is the clearness with which he keeps his self-interest before him, judging by it practically every question and situation. To this he is never blind, but it may make him indifferent to the interests of others or avaricious and untruthful, and is perhaps the great reason why a really sincere and warm friendship can scarcely arise between an Arab and a European. To an Arab friendship with a European is likely enough to be a thing resting on a lively sense of present and prospective personal advantage.

The nomad Arab is the better type of Sudanese Arab. He is less given to crime than the riverain Arab, and is more cheerful and generous, and his life is altogether more free and open; he is more inclined to respect the rulings of older men; he is cleaner in his person, and has really much better manners, although the riverain villager may be a more supple and adaptable creature when consciously trying to 'manage' some government official. By comparison with the villager the nomad may often appear distrustful and unaccommodating, but he is really much more genuinely polite and hospitable. 'It is only in the desert and during the rains, or in the winter while water is still on the surface, that the nomad Arab is really happy. The whole desert is his to roam, and he sees his animals fattening in lush grass. He feels a free man, and this frame of mind is reflected in his behaviour to a stranger; he greets him joyfully and with full ceremonial; whereas, had he been camped near some frequented wells in the country of the sedentary villagers,

he would have been listless, suspicious, and inclined to take no more trouble than he need.'

The sedentary Arab is apt to be untruthful, lazy, and thievish. His village, except on feast days, has been described as 'not a very joyful community'.

*Daily Life.*—The nomad Arab is up at sunrise to set about his business of getting his animals out to good grazing and watering. The task of filling the troughs round the wells with water entails much labour, and one will almost always find men busily engaged at it, sometimes even during the night; perhaps an even more important share of the nomad's business hours is occupied in looking for lost animals, and but for these occupations he would have very little with which to fill in the average day. Other activities connected with his mode of life will entail the dispatching of some men on what may be two or three days' journey to fetch the salt necessary for the well-being of the animals, while others will be away for months travelling for the gum merchants, &c., or to fetch grain for the camp in exchange for the money got by leasing their animals for transport. The marketing of their animals may mean about a month's absence, including the journey to and from the market and some five days' stay there.

The nomad has practically no cultivation to attend to. His wealth lies in his animals and he has immense pride in large flocks and herds, viewing them as the outward and visible symbols of his personal greatness.

In the evenings after the day's work there is abundant opportunity for that talk in which the Arabs delight; money, women, and their animals are their staple topics, and this opportunity is also taken for hearing, discussing, and deciding any disputes that may have arisen.

The small herds of sheep and goats, numerous donkeys, and some cattle and camels owned by the villagers are based on the village and graze a short distance from it. The villager has a good deal of cultivation to attend to, which involves clearing the ground, cutting down bush, keeping the ground clean,

sowing, hoeing, and harvesting. In this way the period from June to November will be taken up. These then, are the busy months for the villager. Many also have gum gardens, which involve the labour of tapping the trees, going round to collect the gum, and taking it away to sell.

The riverain is a much busier man than the non-riverain villager since he has crops all the year round. He has rain cultivation from June to November and seluka cultivation for the rest of the year. If a busier, he is not a happier man than the nomad or the non-riverain villager, and, in spite of all his industry, he is not actually better off economically. This comes from the limited amount of land at his disposal, while of animal wealth he has little or nothing. The painful and difficult disputes arising from surreptitious appropriations of portions of his land and squabbles about water and strayed animals have no exact analogue in the case of the non-riverain villager. Of the land within the recognized sphere of the latter's village only dispersed patches are usually cultivated, and these will vary from time to time, whereas the riverain villager is restricted to a small strip of land of which he must make the best, which demands unremitting toil, and which, owing to flood conditions, cannot always be depended upon to yield well. The land disputes that arise among non-riverain villagers occur when one individual begins to cultivate within what another individual regards as being within his sphere. In some cases the former's right of cultivation may be upheld in consideration of the fact that such land had previously been quite uncultivated, that its cultivation was in itself desirable, and that the objector could find plenty of land as good elsewhere only waiting to be cultivated. Generally speaking the abundance of land available makes such disputes to lack the real seriousness and bitterness of disputes regarding riverain land.

*Dwellings, Furniture, Dress, Arms, &c.*—The typical form of permanent dwelling throughout the Sudan, save in the towns and along the Nile, is the tukl or cylindrical hut with a pointed thatched roof. In the hot weather open sheds (*rakuba*) are

used. Many of the nomad tribes, on the other hand, live in tents which are sometimes little more than rough shelters against the wind. These are made of camel's or goat's hair matting (*shobaka*), or east of the Nile of palm matting. These become very sodden with rain. In the towns and along the Nile the typical Arab flat-roofed dwelling is found, usually built of sun-dried bricks or *galus*. The villages vary much in size, but twenty to seventy huts is the average.

Furniture is of the simplest possible description, and often only consists of one or two angarebs or narrow native bedsteads, a mastaba or seat of mud or masonry built against the wall, with some pots and pans and gourds.

Dress is as a rule very simple. That of men usually consists of a pair of full cotton trousers over which a long cotton garment is worn. A thick white turban is worn over a *takia* (skull cap). Women as a rule wear a dark blue *tob*, and in towns the better-to-do wear a *milaya* or white cotton sheet brought over the left shoulder and under the right arm. Among the nomads, and particularly among the Baqqara, much jewellery and amber is worn by the women; the nose ring is common. The same applies in a less degree to the sedentary population. The women are much given to the use of perfumes and unguents, and to fumigating themselves with the smoke of talh wood and sandal wood.

Food consists chiefly of camel's, cow's, or goat's milk, as the case may be, and dukhn or dura made into *kisra*. Meat is eaten chiefly on special occasions, as when there is a guest. Chicken and eggs are also eaten, and various herbs and wild vegetables are used for spicing meat. The purer Arabs are strict in their views as to the use of intoxicating drinks and tobacco. Their only stimulant (if any) is coffee. The sedentary Arab drinks a good deal of native beer.

Like all the Moslems of the Sudan, the Arabs, men and women, score their faces. These marks (*wasm* or *shillukh*), as, for example, the three parallel lines cut with a razor in the case of the Ga'alín and cognate tribes, are usually referred to as tribal marks, but there seems no justification for calling

them so. Women usually stain their gums a dark blue colour and their nails with henna.

The nomad Arabs always carry arms, usually straight swords and a few small spears. The Baqqara carry a very long, broad-bladed spear. Rifles the Arab rather affects to despise, seldom carries, and makes a poor use of. To own a horse is his great ambition. The Arab villager usually carries a spear and an axe when travelling, or a sword, if he owns one.

*Family Life, Feasts.*—Up to the time of the British occupation the whole family economy was based on slavery, the abolition of which not only affected the prosperity of individuals—and especially that of the sedentary cultivators—but also the whole social tradition. Slaves were as a rule well treated being regarded as part of the family. The interests of those ex-slaves, who still choose to continue in domestic service, are carefully safeguarded by the Government. Women manage the household affairs, their especial functions being the drawing and carrying of water, the grinding of corn, still as a rule performed by the primitive apparatus of hand grindstones, and the cooking. Children assist in the labours of the field, grazing, and irrigation.

The family life of all the peoples of the northern Sudan is governed by the laws and institutions of Islam, but there remains a considerable substratum of pre-Mohammedan customs and ideas, varying according to district and tribe. Polygamy, within the limits allowed by Mohammedan law, is general, but the abolition of slavery has tended to limit the size of the harems maintained by the more wealthy. There is little seclusion of women except among the wealthier town Arabs; among the nomads the position of women is comparatively high, but women are on the whole well treated, have a considerable amount of liberty, and are consulted by the men.

Among the majority of the nomads marriage with the son or daughter of a paternal uncle is usual; this, however, is prohibited in the Jebel Meidob district, though the restriction does not extend to children of a maternal uncle.

Among the riverain Arabs the bridegroom remains with his wife's family for a year after marriage.

Matrilinear descent was of old the custom in nomad tribes on both sides of the Nile, and traces of it survive, as among the inhabitants of Jebel Meidob, and of El-Haraza and Abu Hadid in northern Kordofan, all of whom claim Arabic descent. Inheritances are usually held jointly by all heirs, in the proportions laid down by Moslem law.

There are the usual family festivals observed by Moslems, marriage, circumcision, shaving of the child's head, each with its attendant ceremonies ; and there are also public festivals, such as the Birthday of the Prophet (Mulid el-Nebi), or those connected with agriculture. On all such occasions dancing is very popular.

Circumcision (*tahur*) takes place in infancy among some tribes, among others at puberty. In the latter case the accompanying ceremonies make it resemble a tribal initiation. Girls also are usually subjected to circumcision (*tahuret sunna*), or to the more serious operation of excision (*tahuret farohen*), generally between the ages of five and ten. There is little or no ceremony in their case.

A general custom among the Sudanese Arabs is the offering of food to the dead on the last Thursday in Ramadan. This is called the Feast of the Dead (*Ashaa el-Maiyitin*). The people round Arbat sacrifice a kid to the dead at burials. A year after death a great feast is held among the nomads, at which mourning is ceremonially discarded.

*Superstitions.*—The Arabs of the Sudan are nominally Moslems of the Malakite rite (see 'Mohammedanism', p. 245), but their religion is much mixed with pre-Islamic cults and superstitions. The outward observances of Islam, prayer, the Ramadan fast, abstention from smoking and alcohol, are usually attended to, while the proximity of the holy places in Arabia leads to frequent pilgrimages ; but the true tenets of their faith are imperfectly understood, and the nomads in particular, being out of touch with great religious centres, tend to be unorthodox. They are liable to be easily stirred



by self-styled Mahdis and prophets, and readily believe in his miracles. They show great deference to 'holy men' (*walis*), to the descendants of the prophet (*sherif*, pl. *shurafa*), to doctors (*hakim*), and to teachers (*fiqui*, pl. *fugra*). Gifts are made to the wali on family festivals, and madmen are taken for cure to a wali or to the tomb of one. The hakim is primarily a medical man, who may introduce religious charms into his treatments; the fiki is a religious man, who only encroaches on medicine by supplying such charms or by lending his prayers: both often co-operate in a cure. The influence of the fiki, though still considerable, is said to be declining in Kordofan and elsewhere.

Sudanese Arabs, though growing more and more sophisticated, are still intensely superstitious; but their superstitions are so many, so varied, and at times so vague, that it is difficult to become acquainted with them, the more so because of the Arabs' disinclination to discuss them freely. Again, too, the border line between general superstition, medical practice, and religious rite is absolutely indefinite, so that it is practically impossible to isolate them. What has to be recognized is that the people are surrounded by an atmosphere of the supernatural, in which the dread of ever present evil, seen and unseen, emanating from man, ghost, and devil, is hardly counterbalanced by their faith in deity and belief in the efficacy of holy writings. To the ignorant native no process is too absurd for his credulous faith and fear, and often, within his limits, no price too high for magical assistance. The theory of disease is based entirely on supernatural visitation, and, on the theory that prevention is better than cure, they purchase and wear a collection of preventive charms and safeguards, and these are also placed on their children from their earliest years. One will seldom find an Arab who does not carry at least a talisman against the evil eye, another against evil spirits, and one or two having to do with love. Charms and amulets are of every variety, the favourite being scraps covered with cabalistic writing, or words from the Koran or other authorities; these are called Kigabat. Women

usually wear theirs suspended round their necks and hanging on a level with the breasts and hips ; men often wear them in large bunches above the bend of each elbow, those of the better class wear them on the left flank next the skin, threaded on a silk or leather cord passed over the right shoulder. A suspected possessor of the evil eye, called *Sahar*, is held responsible for all local calamities and is driven as an outcast from place to place. Sometimes the services of a *Sahar* are purchased to injure an enemy. Magic and sorcery are largely practised. The Ghodiat, between Jebel Kordofan and Lake Rahad, are credited with various magical powers by their neighbours ; women soothsayers are consulted in the Jebel Meidob district, and rain makers are found, but among some tribes their power is very slight.

Next to the evil eye as a cause of disease and misfortune come evil spirits, genii, afrete, shatan, baati, fairies, ghosts, metamorphoses from man to animal and vice versa : men possessed (*zurr*, *shaukh*), &c., all apparently under the very nominal control of Suliman, son of Daoud. There are, it is true, an equal number of good spirits. Among the evil spirits there are degrees, some, such as Tiltamish, Yahoush, Habteet, Attatsh, Anshil, Bouni, Aybareet, &c., apparently do not descend to the depths of evil and depravity to which spirits of a lower rank fall, such as Um el-Sibian, who accounts for great harm and provokes many preventive charms. She is described as a lean and loathsome old woman, possessing control over all mankind, travelling invisibly, and destroying by her mere presence, a veritable goddess of sterility and destruction.

Superstition, in the form of magical beliefs, sympathetic and symbolic, faith in mystic writings, the influence of spirits, ghosts, and the like, and the belief in talismans, amulets, and charms, has, then, become blended with religion and with medical custom and practice. In viewing these beliefs one must take into consideration the unstable nervous and mental condition of a great part of the people, the influence on them of environment and suggestion, the prevalence of a primitive

animistic tendency, all tending to produce a sincere faith in their supernatural world, this very faith in turn becoming an actual cause, through psychic concentration and mental suggestion, of 'cures' and other occurrences which in turn strengthen the faith itself.

*The Arab Attitude towards Government.*—In endeavouring to understand the Arab peoples of the Sudan it is necessary to clear one's mind of the associations connected with the words 'fighting dervish'. It is, of course, perfectly true that the Mahdia exhibited the fierce fighting spirit which could be aroused in the Arab peoples of the country, and the Baqqara were the backbone of the Dervish armies. But it has to be remembered that many of the fiercest warriors were furnished by the Beja, who are not Arabs, and that in any case the spirit of warlike revolt had been very slow in awakening. The way in which the Arab population of the Sudan had patiently endured Turkish rule for some sixty years (1821–82) exhibited its almost unparalleled patience in highly provocative and exasperating circumstances. On the reconquest pacification was effected on the whole rapidly and easily, and it would be an entire misconception to interpret any sporadic outbreaks that have since occurred as indications that the population still remains savagely fanatical and warlike, resentful of non-Moslem rule, and only waiting a favourable opportunity to rise in revolt against it.

On the contrary the Arab really only desires to be left alone, and it is but fair to him and to the present government to lay stress on how little inclination he has shown to indulge in any excess. So long as he is treated with what he recognizes as fairness and consideration he is conscious of no quarrel with the existing administration. As to the non-Moslem element represented in it by the British, many of the Arabs are even now unconscious of the fact. To such the government is simply the return of Turkish rule, and the present administrators are for them just the old Turks back again, but become just and firm without being harsh and exacting as formerly. It is true the Arab has his grievances ;

the suppression of the lucrative slave trade with the consequent interference with his social fabric no doubt caused much actual hardship and led to some resentment, but even that has subsided ; and while, like all Arabs, there is an element of fanaticism in his nature which can be played upon by excited visionaries, the disturbances due to this cause which have occurred have been few on the whole and easily dealt with.

Altogether it may be said that the Arab has acquiesced readily enough in the new government, and even more, that he is alive to its real advantages and appreciative of its benefits, and that any organized opposition to it would be felt to be without necessity or justification, and would be indeed alien to the people's whole way of thinking. Contrary to the belief of many, the Arab of the Sudan, though he carries arms and is brave enough, is not aggressively military in spirit at all, and is ready enough to let his arms remain the merest adjuncts of a gentlemanly equipment and symbols of a proud tradition of freedom. He will not use them except under considerable provocation, and the government has as little cause to apprehend his collective, as the traveller has to anticipate his individual, violence.

The nomadic organization is one of amazing fluidity, exhibiting quasi osmotic processes, although it is difficult to find any proper analogy. An endless process of exchange takes place among the constituent members of the many incohesive tribes, themselves uncertain in their alliances, as these break off from one section or tribe to unite themselves to another. This process is continuous and endless since it never results in complete disintegration or reintegration. Altogether the nomadic organization is opposed to concerted effort on any large scale, even were there any cause for it recognized by the Arabs. As a matter of fact they do not feel any common impulsion or recognize any common object such as might sweep the whole race into violent action, so long as their religion and customs are respected and they are free to live their lives in their own way. Under the existing

administration, if the Arab is ever treated with what he considers unfairness or lack of consideration, it only arises through some failure of understanding, and he is ready enough to make allowance. What he clearly recognizes is that the government is never actively oppressive, and he is learning that it is at any time only unintentionally unjust according to his standards.

#### HAMITES (BEJA)

At the present day the true Hamitic area of the Anglo-Egyptian Sudan extends from the Red Sea to the Nile, from the Egyptian boundary in the north to the neighbourhood of the junction of the Atbara with the Nile. South of this there are no easily defined natural boundaries; but the tribes do not come west of the Atbara in any strength, so that, roughly speaking, this river may be considered their western limit until it reaches the Abyssinian boundary between  $15^{\circ}$  and  $14^{\circ}$  N. The area so defined embraces the Red Sea coastal plain and the whole of the eastern desert, which, south of Tokar (about  $18^{\circ} 30' \text{ N.}$ ), gives place to hills and irregular, much-dissected plateaux, grass-covered and well watered for a considerable part of the year. Though not richly vegetated from a European point of view, the comparative fertility of these hills facilitates the entire family and tribal life of the Beja. There is no necessity for a great organized effort—as among the Arabs of Kordofan—to get through the dry season, the movements of families are largely casual wanderings, and, except at places like Sinkat where the inhabitants have almost given up their nomad life, tents are commonly pitched singly or in groups of three or four.

*Tribes.*—The tribes inhabiting this area may be divided into three groups; from north to south these are:

1. The Bisharin, extending for some 80 miles south of the Egyptian boundary and occupying a strip of territory stretching along the right bank of the Atbara.

2. The Hadendoa, comprising a number of closely allied tribes of which the Hadendoa is the strongest and best known.

Including the Amarar, the Nurab, the Ashraf, and the Artega, the country of the Hadendoa extends south and east of the Bisharin territory as far as Tokar and the Khor Baraka. Scattered groups of Hadendoa are found among the hills to the south of this khor, though here the Beni Amer so predominate that the country must be considered to belong to them. West of the Khor Baraka and its main tributary the Khor Langeb, the country belongs to the Hadendoa, who stretch south-west to the neighbourhood of Kassala. The Halenga, who have adopted many Abyssinian ideas and habits, should probably be included in the Hadendoa group, they are certainly Beja; even this cannot be stated with certainty of the Hamran.

3. The Beni Amer, who occupy the country south of the Khor Baraka and extend into Eritrea, where they form one of the most important elements in the population.

*Language.*—The Bisharin and Hadendoa (and allied tribes) speak a Hamitic language called To Bedawi, the Beni Amer speak a Semitic language known as Tigre; but in spite of the difference in language the habits of the Beni Amer and Hadendoa are largely identical, although the latter are fiercer and wilder. This was well shown during the Mahdia when the Beni Amer took practically no part in the fighting which was so courageously sustained by the Hadendoa, the ‘Fuzzy-Wuzzy’ of the British soldier.

All these tribes are divided into divisions corresponding to the *khasam beit* of the Arabs and called *bedana*.

Every *bedana* has its own camel brand (Arabic *wasm*) except where sections have split off recently and retain the brand of the parent division. The same brands may be used for cattle, but they probably have not been introduced for cattle generally, and divisions that have never possessed camels, having no original *wasm*, generally do not brand their cattle.

The Bisharin and tribes of the Hadendoa group are extremely democratic, and this, no doubt, is fostered by the independence resulting from their mode of life, as well as from their consciousness of common origin. By all accounts the Hadendoa

would, if the necessity arose, yield ready obedience to the head of the Wellaliab division in the neighbourhood of Kassala, who is recognized as the old hereditary paramount sheikh of the Hadendoa. The local sheikhs who, in some cases at least, owe their position to the Government, do not seem to be greatly revered, unless they are also men of distinction in religious matters, when they may wield very real influence, as in the case of Sidi Hassan of Tokar, who is looked up to as a *fiki* and whose invocations, when muttered over a knot he is tying, are believed to be of undoubted efficacy.

*Social Organization.*—The social organization of the tribes consists of a number of divisions (*bedana*) with patrilineal descent, and each having more or less strictly fixed territorial limits. Nevertheless there is a very considerable degree of give and take in the arrangements made for the pasturing and watering of the flocks, and while the boundaries of each division are known, they are by no means strictly adhered to in practice. This applies even to such large units as tribes, for the Hadendoa allow the Amarar to graze their beasts freely over their land for no other reason than that the territory of the Amarar is inconveniently small in relation to the number of their flocks and herds. The Amarar and the Hadendoa divisions in the neighbourhood of Sinkat and those around Suakin, in other words the strongest and most advanced divisions of the tribe who have long been subject to foreign influence, practice some cultivation, using the land at the edge of a khor, or even within it when no other is available; on the other hand, some of the more isolated and backward divisions living among the hills inland in the neighbourhood of the Italian frontier have absolutely no cultivated land. Such divisions, of which the Bedawib and Sinkatkenab may be taken as examples, are in many respects far more backward and uncontaminated by foreign (Arabic) cultural influence than the condition of the mass of the tribe would *a priori* suggest.

Democratic feeling, so strong among the Hadendoa, is

weaker among the Beni Amer, who differ from their northern neighbours in that they are a nation that has arisen from a number of politically distinct elements, rather than a people formed by the cohesion of a number of closely related divisions. Thus from the national standpoint the Beni Amer are less homogeneous than the Hadendoa and kindred tribes, for they include a number of To Bedawi-speaking or bilingual communities, whose physique and appearance betoken northern rather than southern origin. These communities have, in fact, been isolated by the northern advance of the Tigre-speaking tribes, so that it is not surprising to find that among the Beni Amer certain divisions rank far above others, and it is no exaggeration to speak of the highest of these—the Nabtab—as forming a hereditary aristocracy. With the Nabtab, but ranking below them, are the Adhaseri, whose chiefs intermarry with the Nabtab and who are definitely looked upon as a superior people by the other divisions of the Beni Amer. It is not easy to obtain any exact idea of the power of the Nabtab at the present day, for privileges of the kind they enjoyed fifty years ago are naturally not encouraged by the Government. At this time according to Munzinger the Nabtab exercised a real feudal rule, and had rights and privileges over the cattle of other divisions and the booty taken by them on raiding parties. They possessed the right of life and death over their clients, and incurred no blood guilt if they killed them. It is notable that whereas the Nabtab and Adhaseri have large herds of camels, no other sections of the Beni Amer have had any until recently, when the Afilanda and possibly the Labet have acquired a few. The possession of camels is certainly a sign of wealth, wealth being actually reckoned in live stock, and the camel is the most valuable of cattle all over the Eastern Sudan. There seems, however, to be a further prestige than that of wealth connected with the possession of camels and this is probably connected in a vague way with the tradition of Arab blood. Those sections possessing no camels are despised by the camel-owning section as ‘aborigines’ and sometimes



characterized as *tigray*, 'slaves', though the latter may boast an Arabic *nisba* and actually carry as much, or rather, as little Arab blood as the camel owners. At the present day although the chief of the Nabtab is regarded as *nazir* (paramount chief) of the Beni Amer, and may be said to 'rule' the tribe from Aqiq, his position seems to be largely due to traditional prestige, strengthened by his right to collect a certain amount of tribute.

*Physical Characteristics.*—On the physical side, great interest attaches to the Beja owing to the fact that the Beni Amer, their purest representatives, reproduce with astounding fidelity the physical characters of those early Hamites, the predynastic Egyptians, the earliest known inhabitants of the Nile valley. In stature (about 64 in.) the two people are identical, and the same may be said of the measurements and character of their skulls. Northwards the skull becomes progressively broader, its length remaining approximately unaltered, so that the Hadendoa skull is rounder than the Beni Amer and the Bisharin skull almost brachycephalic. There is little difference in height between Beni Amer and Bisharin, but the Hadendoa are distinctly taller and often darker, both these qualities no doubt being due to Negro admixture. The fact that the Hadendoa, unlike the Beni Amer, often have typically Armenoid (so-called 'Jewish') noses is no doubt to be explained by an infusion of foreign blood from the other side of the Red Sea. Ignoring these minor differences and summarizing the physical characters of the Beja, it may be said that they are moderately short, slightly built men, with reddish-brown or brown skins in which a greater or less tinge of black may be present. The face is usually long and oval, or approaching the oval in shape, the jaw is often lightly built, which, with the presence of a rather pointed chin, may tend to make the upper part of the face appear broader than it really is. The nose is well shaped and thoroughly Caucasian in type and form, except in those individuals, comparatively few in number, in whom Negro influence may be suspected. The hair is usually curly, in

some cases it certainly might be described as wavy, but the method of hair dressing adopted tends to make difficult an exact description of its condition. Often, as is everywhere common amongst wearers of turbans, the head is shaved. Where the hair is very tightly curled or approaches the woolly, this is to be regarded as evidence of Negro admixture, and indeed in these cases there is generally other physical evidence of Negro influence. The hair on the face is sparse; slight side-whiskers, moustache, and chin-tuft beard are the rule, leaving the area between the lower lip and the chin bare, while there is also some considerable space between the whiskers and the moustache. Occasionally, when the facial hair tends to outgrow these limits, shaving may be resorted to in order to reduce the beard to the usual type. Not uncommonly, especially in the younger men, the whole face is shaved.

*Marriage.*—The marriage between a man and his father's brother's daughter (*bint 'amm*) is esteemed the best, as it is among all Muslimin in the Sudan. It is not, however, obligatory, though a man would consider that he had a prior right to the hand of his *bint 'amm*. Although polygamous it is only the rich men who can afford a plurality of wives, but this difficulty is to some extent compensated by the frequency of divorce. The bride-price naturally varies according to the wealth of the contracting parties, a Beni Amer sheikh recently paid eight camels and £4 to his bride's parents, a slave and two she-camels to the bride, and £1 to the bride's mother's brother. A man may not speak to, or come in contact with, his mother-in-law, though his first child should be born in her house. After two or three children have been born he gives her a present, and may then speak to her. A man may speak to his father-in-law, but will never eat with him, i.e. out of the same dish at the same time. Beja women are perhaps less strictly chaste than the women of the nomad Arabs; those of the Beni Amer being said to be generally more complaisant than those of the Hadendoa, apart from certain southern sections of the latter.

*Daily Life : Dwellings.*—As there is no need among the Hadendoa for a great organized effort in which the whole division takes part to get through the dry season, tents are usually seen in groups of three or four, except at places like Sinkat, where the inhabitants have almost given up their nomad life. In the dry season some of the men take the camel herds to the best and widest pastures, many of the herdsmen of the Hadendoa (especially of the Sherab and Bishariab divisions) going to the coastal plain, and the Ashraf and the Artega to the green hills south of the Khor Baraka, while their families move about in small groups, erecting tents that vary in size according to their proposed sojourn, which, in turn, is regulated by the amount of pasturage for their cattle. When the halt is likely to be for a few days only, a tent of three or four mats is enough, or even a rude shelter of dried euphorbia stems may suffice. A rough zariba is built for the young goats and sheep, or they may be brought inside the tent at night. Dead euphorbia stems afford excellent protection when driven into the earth in a semi-circle and slanted so that they form both walls and a half-dome roof. Such shelters are built wide for the cattle and are further strengthened at night with thorn. Smaller circles, forming real huts in which people live, are sometimes seen, and in these cases tents are dispensed with altogether. Many such encampments wherein the people are likely to stay throughout the dry season are made yearly on the hill slopes near Erkowit. Or advantage may be taken of a place where a wet season torrent has cut a bay, leaving a cliff-like bank some 8 or 10 ft. high, the natural shelter being so improved with mats, wood, and thorn, that two or three families may settle for the dry season.

Among the Bisharin, who live in a poorer country, each division has its own territory, but so long as grass is plentiful its members do not limit themselves to this; it is only towards the end of the dry season, when grass may be scarce, so that the herdsmen are compelled to feed their flocks on the leaves and branches of trees (which they pull down by means of

a stick two or three metres long with a terminal crook) that each division should restrict itself to its own territory. A little dura seems to be grown in certain localities, but none in the mountains; in spite of this enough is traded for grain to enter into the general diet.

*Weapons.*—The Beja weapons are the spear, circular shield, and curved dagger. The sword, which under Arab influence has penetrated everywhere throughout the non-Negro portion of the Sudan, though frequent among the richer and more civilized divisions, is scarcely known among the poorer relatively uncontaminated folk living among the hills in the neighbourhood of the Italian frontier.

*Industries : Milk Observances.*—The Hadendoa make pottery vessels, the Bisharin do not, but produce stone (steatite) vessels which they use for cooking and for holding fat. These are made in certain villages on the range of hills called Jebel Jerri or Jebel Jerf, about two days' journey inland from Mersa Shab, on the Red Sea coast. This range is said to be the only place in which soapstone is found. The pots made in the neighbourhood are exported all over the Bisharin country, but they are not used by the Ababdeh to the north or by the Hadendoa.

A much more important part in the domestic economy of the Beja tribes is played by their beautifully constructed basketry vessels, so well made that they are habitually used to contain milk. There are indeed a whole series of observances with regard to milk which not only indicate that this food is not regarded as 'common', using the term in the biblical sense, but which also seem to show that pottery-making is of comparatively recent introduction. Thus none of the Beja tribes milk into a clay vessel or put milk into one of these, in spite of the fact that many of the Hadendoa make pots. Nor would it be permissible to milk into one of the modern tin bowls which Europeans have recently introduced into the country. Gourds and basketry vessels, especially the latter, are considered the appropriate receptacles for milk, though skin vessels, *girban*, may be used. Nor may any man of the

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Bisharin or Artega drink the milk he has himself drawn, whether the animal is his own property or not, until some one else has taken three sips. There may be some exaggeration in the statement (Bisharin) that a man would rather die, but clearly the act is regarded as detestable. There are also customs concerning the cooking of milk which vary from tribe to tribe : thus the Beni Amer and Bedawib commonly cook their milk by dropping into it hot stones as it stands in one of the wide-mouthed basket-work vessels called in Arabic *umra*. On the other hand, the majority of Hadendoa will not cook milk, and in this the Artega and Ashraf resemble them. No menstruous woman drinks milk lest the animal from which it was drawn should suffer, and the Bedawib say that any infringement of this rule would render sterile both the woman and the animal from which the milk was taken ; nor may a menstruous woman drink *semn*, the liquid butter of the country.

*Customs.*—In considering the manners and customs of the Beja it must be remembered that these tribes are now perhaps the most fanatical Mohammedans in the Sudan, and that consequently at the present day only such of their old usages have survived as are not contrary to the written word of the Koran. The majority if not all the Beja were, however, heathen during the lifetime of Makrizi (A.D. 1366–1442) and it was of these that he wrote : ‘ They are nomads living in skin tents which they carry wherever they find grazing. Their genealogies are counted in the female line. Each tribe has a chief but they recognize no paramount. They have no religion. Property passes to the sons of sister and daughter to the prejudice of the son of the deceased. To justify this custom they say that there can be no doubt as to the parentage of the son or daughter of a sister and that these must belong to the family, whether their mother had got them by her husband or by another man. They formerly had a paramount chief to whom all the other chiefs were subordinate.’ Makrizi adds that the Beja had many dromedaries and camels besides sheep and cattle innumerable which provided them with meat

and milk. In another passage Makrizi speaks of the Beja as a people utterly irreligious and unintelligent. Both men and women go naked, having no other covering than a loin cloth and the majority of them lacking even this.

Here is a perfectly definite account of a pagan, nomad, pastoral people with matrilineal descent, living almost entirely upon the milk and flesh of their flocks. With the exception only of the matrilineal descent, which has been given up owing to the introduction of Islam, and the wearing of the Arab clothing, the picture drawn by Makrizi is that seen by any traveller in the eastern desert at the present day. Moreover, even a slight acquaintance with the people is enough to show that they retain indisputable traces of a former matriarchy. These are most obvious in their marriage customs, as the following examples show.

Among the Hadendoa the bridegroom goes to his bride's village to be married and stays there from one to three years. The tent for the young couple is usually built some 60 to 70 yds. from that occupied by the girl's parents, i.e. at the least distance that the stringency of the rules of avoidance between son-in-law and mother-in-law renders convenient. The framework of the tent and the furniture, especially the marriage-bed, are provided by the bride's relatives who erect the dwelling, though the strips of matting, which when sewn together form the tent, should be provided by the bridegroom. While living with his wife's people a man accompanies his father-in-law whenever the latter moves to new pasture, he should help him in all matters and in fact be to him as a son. For about the first month after marriage the bride spends her days in her mother's tent, meeting her husband only at night. During this time his food is prepared by his mother-in-law and sent to his tent. There does not appear to be any strict rule that the first child shall be born among its mother's people, but it is obvious that under the conditions stated this must often occur. A more stringent rule prevails among the Amarer, who say that a woman must be delivered of her firstborn in her mother's tent, or, if this is



impossible, among her mother's people, and, even if she has left them, she will return when her time approaches. The Bisharin custom resembles that of the Amarar as does that of the Beni Amer. Among all these tribes the husband carries his wife away to his own people from one to three years after marriage; the Beni Amer, however, say that, although that is what happens normally, a woman has the right to decline to follow her husband, and that, if she persists in this attitude, her husband would have no other resource than to visit her from time to time, since he could not be expected to settle down permanently among her people. Thus a girl, even when married, remains an object of concern to her parents and her division, and her mother's opinions and desires do not cease to be of importance to her husband.

The importance of the distaff side is further shown by the legend of the origin of the Hadendoa from one Hadat, whose grave on the banks of the Khor Amet is still recognized. Her husband was one Mohammed Barakwin, from the other side of the Red Sea, a descendant of Abbas, uncle of the Prophet. Her seven sons gave rise to seven of the divisions of the Hadendoa, the sons of the founders of these divisions marrying with the daughters of the land from which unions sprang the Hadendoa nation. This legend illustrates two interesting points; the traditional origin of the tribe from a woman agrees with what is said by mediæval Arab historians concerning the matrilineal succession and matriarchal habits of the Beja, and the introduction of a descendant of the prophet as ancestor illustrates the marked tendency which all these tribes exhibit to glorify everything Arabian, no matter how remotely connected with Mecca. It is this tendency no doubt that has led the Hadendoa to call themselves *Aarab*, which in turn has compelled them to speak of the true Arabs by their tribal names or simply call them Bedu.

Several customs prevalent among the Beja appear to link them to a remote Hamito-Semitic culture. Chief among these are customs connected with milk already alluded to, which resemble those described in the Old Testament, and also

some still practised by the half-Hamitic tribes of East Africa. Again, there are implements of daily life identical with those of the early Egyptians. Thus all the Beja have the throwing-stick (boomerang) and the Bisharin still use the wooden head-rest which in Egypt dates from the eleventh dynasty. Moreover, one of their basketry vessels, ornamented with triangular areas covered with dyed leather, recalls a type of black pottery vessels with alternate plain and white-spotted triangles which has been found in tombs of the first dynasty.

#### DIVISIONS OF THE BEJA

##### *Ababda*

The Ababda are divided into three great groups—the Eshabab, the Fogara, and the Shanatir—but only part of one subtribe, the Meleikab of the Fogara, is under Sudanese administration, the rest of the tribe being in Egyptian territory.

##### *Bisharin*

The Bisharin are divided into two great groups: (1) the Um Ali; (2) the Um Naji.

1. The Um Ali have the following subtribes and divisions: (i) Aliab, with divisions Koatil, Mallak, Hamedomerab, Kurbeilab, and Balgab (the first three of these are sometimes classed together as the Sararab; (ii) Amrab; (iii) Shantirab; (iv) Hamedorab.

2. The Um Naji have the following subtribes and divisions: (i) Hamr; (ii) Eireiab; (iii) Nafab; (iv) Mansurab.

##### *The Hadendoa and Related Tribes*

No useful list of the subtribes and divisions of these tribes can yet be made.

The traditional origin of the Hadendoa (see *supra*) is from Hadat, a woman of the land, whose seven sons gave rise to the following seven divisions of the Hadendoa: Amirab, Gamilab, Gurhabab, Hamdab, Samaraidoab, Shebodinab, and Wellaliab, the sheikh of the latter division being regarded as paramount chief of the Hadendoa.

*Beni Amer*

According to Saleh Idris, an old man of Aqiq who is closely connected with the ruling family of the Beni Amer, there are four great branches of the people :

1. The Nabtab, of Jaali origin tracing their descent to Abbas, the Prophet's uncle, speaking both Hadendoa and Beni Amer, who form the Beni Amer aristocracy.

2. The Hāsa, living in the neighbourhood of Tokar, who have recently taken up cotton cultivation. Saleh Idris, who with all the Beni Amer aristocracy boasts of his connexion with Arabia, looked upon the Hāsa as aborigines, though in appearance there is nothing to distinguish a member of the Nabtab from the other Beni Amer sections. Presumably it is through the agency of this large Tigre-speaking section that the language is locally known as Hāsa instead of Tigre. Makrizi states that Suakin was inhabited by ' Khasa ' in his time.

3. The Labet and Bedawib, the latter probably including the Sinkatkenab, speak Hadendoa. The Bedawib and probably the Labet, though considered politically as Beni Amer, are almost certainly ethnically Hadendoa.

4. The Hafera are not found now in British territory. They come from the Khor Baraka, and towards the end of the sixteenth century invaded the Sahel and took possession of it.

The following table shows the sections or subtribes of the Beni Amer and the language spoken by each :

<i>Section.</i>	<i>Languages.</i>
Nabtab . . . . .	Tigre and To Bedawi.
Adhaseri with some 10 subdivisions each under a Nabtab chief . . . . .	Tigre.
Afilanda . . . . .	Tigre.
Beit Mala . . . . .	Tigre.
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Ganifru . . . . .	Tigre.
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The Nabtab and Adhaseri have large herds of camels, other sections have none, with the exception of the Aflanda and possibly the Labet, who may have acquired a few recently.

#### BARABRA OR NUBIANS

There has been a good deal of needless confusion with regard to the ethnic position of the Barabra, or Berberines, the present-day inhabitants of Nubia. The origin of this confusion is discussed at the end of this section; meanwhile it must be remembered that the work of the Nubian Survey indicates that at the very dawn of Egyptian history Lower Nubia was inhabited by a proto-Egyptian race, the near relatives of the pre-dynastic Egyptians whose wares they imported. By the time of the twelfth dynasty the population was a hybrid one, heavily loaded with negro blood, and the recent discoveries at Kerma seem to carry this population south to the neighbourhood of the Third Cataract.

This suggests that, apart from local fluctuations of minor importance, the population of Nubia from the eighteenth dynasty onwards may well have remained substantially unchanged, and that the negro language even now spoken by the Barabra may go back to this or an even earlier period. But although the Barabra (Berberines) speak a negro language, they must be regarded as predominantly Hamitic in blood and culture, and individuals of a physical type recalling that of the proto-Egyptians are not uncommon even now.

*Physical Characteristics.*—The Barabra are of medium height (about 66½ in.), for the most part long headed, often of a slight, rather graceful build, which immediately distinguishes them from the Fellahin. The ‘finest’ type, that in which there is least evidence of Negro blood, is of medium

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or dark bronze colour, with regular features and more or less oval face. The hair is black and almost straight, wavy or curly, but seldom tightly curled or coarse like that of a negro. The eyes are dark, often large and handsome, the nose is well formed and, though generally short, may be long.

*Tribal Divisions.*—The Barabra are divided into a number of tribes, and, although they have adopted the Arab organization, the names of a number of these divisions indicate an Eastern Desert (Beja) origin. The following are the tribal units generally recognized :

1. The Kenus, who often speak of themselves as Nobcen, inhabiting the country between Kena and Korosko (most numerous between Aswan and Shellal).

2. The Motok living in a few poor villages between Shellal and Korosko. They are said to be of small stature and to have more negroid features than other Barabra who tend to look down on them; they supply many of the Cairo syces and speak the same dialect as the Danagla.

3. The Featijeh or Fidaiki scattered between Korosko and Wadi Halfa.

4. The Mahas, stretching from Wadi Halfa to near Dongola.

5. The Danagla in the neighbourhood of Dongola.

*Mode of Life.*—The Barabra are an agricultural people where their country is wide enough to permit of any considerable cultivation, and even where the desert closes in to within a few yards of the river they are quick to take advantage of every strip which at low Nile is left covered with alluvium. But even with the greatest industry the country at the present day does not produce enough grain to maintain its population, and a considerable proportion of its male inhabitants seek their livelihood elsewhere, for they are an enterprising people, great travellers and traders, not unscholarly and quick at picking up a new language. They are to be found as servants everywhere between the delta and Khartoum, and formed a considerable part of the personnel of the Arab slave-raiders in the middle of last century, while for the last hundred years or more they have been exerting a steady and

increasing influence in Kordofan. This is specially true of the Danagla.

*Language, Customs, Dress, &c.*—Most of the men are bilingual, speaking Arabic as well as their own language, of which there are four (according to some three) recognized dialects. The women do not usually accompany the men on their travels, the result being that few know even a word or two of Arabic. These people scar their cheeks with vertical or oblique cuts on each side of their face. They mutilate their girls in the same way as the 'Arab' tribes to the south. Their houses are of the usual rectangular Arab form, and, although the women now wear the Arab robe, it is not fifty years since their customary garment was a short petticoat reaching to the knee. Their hand-made pottery of various patterns is of excellent quality as are their mats and baskets of palm leaf, and Burckhardt mentions having frequently seen small looms in their houses.

*Ethnic Position of the Barabra.*—To return to the vexed question of the ethnic position of the Barabra, the difficulty seems to be in great part due to the confusion introduced by Frederick Müller and Keane, who insisted on applying linguistic criteria to determine the ethnological position of the Barabra. Müller erected a Nuba-Fulah group of languages to include the Barabra dialects and Fulah. Keane rejected this view, almost with scorn, but, on account of similarities in the language, or some of the languages, spoken in Northern and Central Kordofan to those spoken by the Barabra, did not hesitate to proclaim the essential unity of the Barabra and the tall black Negro hillmen of Kordofan. The confusion may have been increased by the similarity of the names Nuba and Nubia. In any case it is not difficult, in the light of fuller knowledge of the Nuba themselves and of the history of Kordofan, to explain the similarities in language which misled Keane; while on the physical side, as on the cultural, there is scarcely a character which is shared by the two peoples.

The Nuba is stoutly built, muscular, and so dark skinned



that he may be called black ; the Barabra is of slight, or more commonly, medium build, not particularly muscular, and in skin colour varies from a yellowish to a chocolate brown. The hair of the Nuba is invariably woolly, that of the Barabra, though approaching the negro in individual instances, is commonly curly or wavy, and may be almost straight, while the features of the Barabra are not uncommonly non-negroid.

Thus, there can be no doubt that the two peoples are essentially different in physical characters, and the same holds good on the cultural side. The Barabra scar their faces in the manner common to the Beja and riverain tribes of so-called 'Arabs'; they circumcise their youths and mutilate their girls, but they do not cover the bodies of their women with cicatrices, neither do they remove their incisor teeth, nor do their women perforate the lower lip in order to wear a lip ornament. The Nuba do not circumcise their boys or mutilate their girls, but do practise the remaining deformations mentioned in the last sentence. Both make pottery, but the technique employed and results attained are utterly different; indeed, the Barabra pottery still strikingly resembles the Egyptian, and there is the clearest evidence that the predynastic tradition in pottery continued in full swing as late as the eighteenth dynasty in Upper Egypt and Nubia.

Lastly, with regard to the language, if the language of the southern Nuba be compared with the dialects (Mahas, Sukkhot, &c.) spoken by the Barabra, it will be found that there is no resemblance. The inhabitants of the *jibal* in Southern Kordofan, but situated a little north of the Bahr el-Ghazal, have a language, or rather a series of languages, with grammatical structure and vocabularies which do not resemble the Berberine dialects; thus in the latter grammatical changes, both in nouns and verbs are produced by suffixes; in the Nuba this is done by initial change. Moreover, in Nuba alliterative assonance prevails to a considerable extent, e.g. the plural of *čalanga jôte* (Eliri), a good club, is

*malanga môte*. That the communities of some of these hills are as yet unaffected by northern influence is shown by the fact that the men still go absolutely naked and uncircumcised, the very first result of Arab (Mohammedan) influence being the adoption of circumcision and the assumption of at least a minimum of clothing. The striking resemblances found between the languages of the Barabra and of the Nuba of Northern Kordofan upon which the theory of identity is based, are in fact due to foreign influence, to which the hillmen have been submitted for a considerable period. It has long been known that the southern Barabra of Dongola Province are keen traders, indeed the traveller in Kordofan soon comes to recognize that these folk have exerted a sustained and increasing influence for a considerable time. As might be expected, this influence is most marked in the north, where important settlements of Barabra have long existed; but there is not the least doubt that it has penetrated to a degree not commonly realized deep into the heart of Kordofan, and it is this pacific and mercantile penetration which must be held responsible for the similarities that have been discovered in the Berberine and northern Nuba languages.

#### SOUTHERN POPULATION

Although the negro has given his name to the Sudan (*Bilad el-Sudan*, the Land of the Blacks of mediaeval Arab authors) and forms numerically by far the most important element in the population, as well as the one that has excited most interest from mediaeval times onwards, yet it is a fact that we have no adequate knowledge of the habits, customs, or religion of any one tribe. On the physical side our information is only slightly more advanced, but even here the data are too few to allow of a general sketch of the ethnic relations of the tribes. The most that can be done is to offer a tentative classification and to indicate where this is likely to be of permanent value.

The true negro undoubtedly represents one of the most primitive of the African stocks. His main physical character-

istics are tall stature, a 'black' skin, woolly hair and moderate dolichocephaly, a flat, broad nose and thick and often everted lips, prominent cheek-bones and a varying degree of prognathism. So defined, the true negro is found in the far western Sudan and the Guinea Coast and probably nowhere else. Moreover, the west African culture contains a number of characteristic features, such as gable-roofed huts, spears with tanged heads, swords, and shields of plaited vegetable fibre. On the religious side there is a great development of fetishism and human sacrifice. Here also are secret societies, masks, and innumerable representations of human figures. With the possible exception of the Masai *sime* which, though it must be regarded as a sword, is entirely unlike those of West Africa and occupies an anomalous position, not one of these characteristic features exists east of the Congo-Nile watershed. On the other hand, although a number of features which do not occur west of the watershed exist in the Nile Valley, these are not so numerous or striking, and there can be no doubt that for a long time, probably for thousands of years, there has been more or less constant drifting from east to west.

East of the watershed, i.e., in the Anglo-Egyptian Sudan, two distinct classes of negro are found, distinguished at a glance by their stature. One group consists of tall negroes or negroids, the other of short negroes or negroids, and as far as is known these groups scarcely overlap in cultural characters. The tall negroes—all so dark skinned that they may almost be described as 'black'—can, however, be divided into two groups, one long-headed (dolichocephalic), the other verging on round-headed (mesaticephalic). The former, which is by far the more homogeneous, includes such kindred tribes as the Shilluk and Dinka; the latter embraces a number of tribes such as the Bari, the Nuba, and the Burun, who, as far as our present knowledge extends, have few obvious common cultural features.

Considering physical characters only, the negroes of the Sudan might be classified as follows:

A. Tall and 'black' skinned: (i) dolichocephalic (typical Nilotes), (ii) mesaticephalic tending to brachycephalic.

B. Short with skin brownish or showing a coppery tinge: mesaticephalic.

#### NILOTES

*Physical Characteristics.*—The tall 'black' skinned dolichocephals are best represented by the Shilluk, the Anuak, the Dinka, and the Nuer with an average stature of about 1.78 m. (5 ft. 10 in.) and a cephalic index which varies around 72. In all these tribes there is a foreign non-negro element that brings them into relation with the half-Hamites of East Africa, and in this connexion the resemblance between the languages of the Bari (who although less dolichocephalic are at least in part related to the Dinka and Shilluk) and the Masai is significant. Although the majority have coarse features with broad or very broad noses, among the Shilluk, and probably also the Anuak, it is not uncommon to meet men with shapely features including thin lips, noses that are anything but coarse, and well-modelled foreheads.

*Mode of Life: Character.*—All the Nilotes are pastoral, often growing scarcely enough grain to supply themselves till the next harvest. For the most part the men go absolutely naked, but, even when this is not the case, the genitals are usually left uncovered. The women wear a pair of leather aprons reaching from waist to knee. The forehead is often scarred and the lower incisors are generally removed. The skin is commonly smeared with the ash of wood and cattle dung. Ivory armlets are worn and the hair may be worked into elaborate head-dresses. Cannibalism is unknown and human sacrifice is almost absent. Not only do these characteristics distinguish the group from the shorter, lighter-coloured mesaticephals, but they differ from the latter in their extreme aloofness and pride of race, showing absolutely no desire for European clothes or trade objects.

*Difficulty of Classifying the Jur and Bari.*—It has been customary to classify as Nilotes the Jur and the Bari, but

their position is not really clear. With regard to the Jur, the only way to reconcile the various accounts is to conclude that there has been confusion between at least two peoples. On the one hand the Jur are described as tall, spare men with slender legs, nearly black in colour, with long narrow heads, who extract the central incisors of the lower jaw, who go naked and ash-smeared while the women wear leather aprons. This description applies to a small tribe living on the Jur river near Wau, who call themselves a branch of the Shilluk and are so considered by the Dinka with whom they intermarry. Obviously the people referred to are Nilotes, but other accounts speak of the Jur as reddish in colour, stout and squat in build like the Golo, and great iron workers whose traditions assert that they have come to their present home from much farther south.

The position of the Bari is even less clear than that of the Jur. According to native legend, the Bari came into the Nile valley as the result of the fission of an old Beri-Bari tribe. Later there were further divisions, as a result of which the Mandari, Shir, Nyefu, and Fajelu tribes were formed. These, together with the Niambara, Ligi, and Kakuak, were said by Emin Pasha to form a sharply defined whole distinguished from their neighbours in language and having many common customs. Thus the 'Bari' territory would extend from the southern frontier of the Dinka country (about Bor) to Gondokoro or even farther south, having a considerable western extension. But, even if this should prove to be accurate, the western divisions show evidence of foreign influence; the Fajelu, and probably the Kakuak, women wear leaves (presumably in imitation of the Makraka) instead of the Bari apron. Further, the Kakuak women pierce the lower lip and wear a quartz pendant, while the Fajelu women cover themselves with cicatrices. Emin Pasha speaks of the 'real Bari', the Shir and Mandari. The Bari of Uganda are described as mesaticephals with relatively long lower limbs, legs, and forearms, but small feet and hands. Judging from general appearance this would be a perfectly fair account

of the Shir, and agrees with the measurements of a number of Bari from the Sudan.

There is no doubt that at least the more northern Bari (such as the Shir), as well as the Acholi to the south, are culturally related to the Dinka, and their tall stature seems to denote an ethnic relationship; indeed it seems likely that the Shir of the White Nile and their riverain congeners of Mongalla province are ethnically by no means identical with such 'sub-tribes' (?) of the Bari as the Fajelu and Kakuak. On the other hand, the tall Nuba stand in no close cultural relation to the Dinka and Shilluk, and perhaps this also applies to the almost brachycephalic Burun. Bearing these facts in mind, it would seem best to use the terms Nilotes and Nilotic as indicating a particular culture irrespective of head-form and other physical characters. At the same time it should be noted that all the riverain tribes with a nilotic culture north of the Dinka-Bari boundary are dolichocephalic, while south of the boundary they are mesaticephalic; hence, if convenient, we can still speak of Northern Nilotes and Southern Nilotes as constituting definite physical groups.

*Westermann's Classification of Nilotics.*—In view of the difficulty of classifying the Sudanese negroes on physical grounds, at least with our present scant knowledge, considerable interest attaches to a classification proposed by Westermann based on linguistic criteria. He uses the term Nilotic in a sense that appears almost arbitrary; it is at least so wide that it seems to retain little significance. But within it he constitutes three groups, 'High', 'Middle', and 'Low' Nilotic which in part at least may be natural.

1. The High Nilotic group comprising Mittu, Madi, Abukaya, Abaka, Luba, Wira, Lendu, and Moru.

2. The Middle Nilotic group comprising the Shilluk, Anuak, Beir, Jur, Belanda, and many of the peoples of Eastern Uganda, the Acholi, Lango, Aturu, and Jaluo.

3. The Low Nilotic group comprising Dinka and Nuer.

It will be noted that the Bari with their numerous constituent 'sub-tribes' are not mentioned. Westermann places

these in his Nilotic-Hamitic group, i.e. with the Masai, Turkana, &c.

*Cattle, Dwellings, Weapons.*—The Nilotes hold their cattle in almost religious esteem; they are rarely killed for meat, but their milk forms the staple article of diet. They are entrusted entirely to the care of the young men, women, during the period of sexual activity, not being allowed to have any dealings with them. On the other hand, agricultural work is almost entirely performed by women.

The huts of the Nilotes are circular with conical or domed roofs, each family occupying 3 to 4 and often possessing a much larger shelter for the cattle. Among the Shilluk the huts of each family are enclosed by a fence of dura stalks; pile houses are found among the Nuer. The Dinka have two forms of settlements—one near the river for the dry season, the other often consisting of pile dwellings at some distance from the river and used during the wet season when the floods are out.

The typical weapon of the Nilotes is the spear; clubs are also used, and some Dinka, e.g. the Agar, have bows and arrows; shields, both large and small, are made of hide.

Fishing plays an important part in the economy of some of the riverain tribes, as the Jur. With the cattle-owning Dinka it is unimportant, but is extensively practised by the Tain Dinka who live amidst the sudd and have no cattle, and also by some Nuer. The Tain Dinka are great hunters of the hippopotamus; indeed its flesh forms a regular part of their diet.

*Marriage.*—Among the Nilotes the dominant feature of their marriage system is the bride price which is paid in cattle. The women have no choice in selecting their mates, and the older men being more wealthy are able to procure large numbers of wives, while the younger men may have difficulty in obtaining one. The bride is usually taken direct to her husband's house. The settling of the number of cows to be paid is of great importance, and as the bride price is usually paid in instalments, adultery, divorce, or the death

of a bride all lead to complicated disputes which may last for years in which several members of the families of both husband and wife may be involved. Certain iron-working groups of Dinka living near the Nile-Congo divide have few or no cattle and pay for their wives in iron.

Widows are inherited by their husband's heirs; the children that they bear are, however, counted as children of the deceased.

The Dinka are divided into totemic clans, the totem passing in the male line, and marriage is forbidden within the totem; the Shilluk, though not totemic, avoid consanguineous marriages.

*Languages.*—The languages of the Nilotic peoples form a sub-group of the general family of languages called by Meinhof 'Sudan'. They are characterized by the absence of inflexion and grammatical gender, by the use of tone rather than accent, and typically by each word consisting of only one syllable. In the purest form of these languages (West Africa), each syllable or word consists of but one consonant and one vowel; but in the Nilotic tongues stems are usually formed with three letters—a consonant, a vowel, and a final consonant.

The nouns have no class prefixes as in Bantu. The differentiation of the Nilotic group of languages from those of the rest of the Sudan is probably due to the Hamitic influence. The most widespread of these languages are the Dinka and Shilluk. The latter resembles so closely the dialect spoken by the Anuak that the two people are able to understand one another and the same is possibly the case with Dinka and Nuer.

The only two Nilotic peoples of whose social organization there is any real knowledge are the Shilluk and Dinka, and accordingly a more extended notice is given of these.

*Social Organization of the Shilluk.*—The Shilluk are divided into a number of groups (probably exogamous), the members of each tracing their descent from a common ancestor, the majority of whom were followers of the first king, the semi-



divine Nyakang, or of his son and successor Dag. The members of each group have special duties, such as helping to build the cenotaph tombs of Nyakang, providing the king with hippopotamus meat once a year, or paying tribute of a virgin to the new king. Certain groups have special privileges, portions of the king's oxen being assigned to them when these are killed. Like Nyakang the ancestors of these groups are culture heroes, one ancestor is remembered as having introduced the art of fire-making by friction, and it is a member of this group who makes fire at the king's accession.

The Shilluk are not totemistic, but certain beliefs exist which may indicate the former existence of totemism. Thus one of the groups recorded by Westermann traces its ancestry to a fish man, and this author also relates a story in which an ostrich, a crow, and a man are regarded as brothers. This distinctly recalls the form of totemism prevalent among the Dinka.

The country is divided into a certain number of districts each under a chief, there are also village headmen, both classes being called *baeng*. It is uncertain whether either class are in reality chiefs of (local) groups claiming common descent (*supra*). A village chief is often of royal blood (*Kwaniaret*).

The Shilluk king is the supreme head of the state, the aristocracy of the nation consisting of the king (*ret*), his children (*niäret*), his grandchildren (*ni'aret*) and his great grandchildren (*kwaniäret*). Royal descent is not recognized beyond four generations. Nyakang was the first of the Shilluk kings, and all subsequent rulers trace their descent from him.

The Shilluk king belongs to that class of ruler known as 'divine kings', so it is not surprising that the Shilluk take every care of their king and pay him much honour. Formerly he was not allowed to go to battle, and even now he keeps up considerable state and has much authority. He usually rides a donkey, and never moves without a bodyguard of some 12 to 20 men, for the most part more or less well armed. In the old

days his word was law, and his decisions are still obeyed in all matters coming before him, e.g. the fines of cattle that he imposes are paid with reasonable speed. The king rules his people from Fashoda (about 8 miles from the 'Fashoda' of history of which the real name is Kodok), and no more eloquent evidence of his power can be offered than the really imposing mound upon which stands his homestead, for, although the Shilluk are intensely lazy and the king (1910) is far from being generally popular, the mound was said to have been built quickly and with the minimum of grumbling.

A large number of the huts constituting the capital are the residences of the king's wives, of whom he has very many. His sons, too, take many wives, but the daughters of a king must remain unmarried, the alleged reason for this being that it is unfitting that the daughter of a king should marry a commoner, while she could not marry a man of royal blood since this would be incest. The prohibition of marriage does not, however, extend to all intercourse; a king's daughter is allowed to select lovers as she chooses, and no objection is made so long as it is not publicly known that she has become pregnant, but, if this were discovered, she would be killed, as would also the man responsible for her condition. This rule, which until recently appeared to have been sternly carried out, led to the frequent practice of abortion.

Although Fashoda has certainly been the royal village for the last few decades and perhaps for a number of generations, there is evidence that at one time each king ruled the country from the village in which he was born and brought up, so that this village became the capital of the country, but remained so only during his lifetime.

Even at the present day care is taken that the royal offspring are not born at the capital but come into the world at a particular village, with which they are closely associated throughout their life. When one of the royal wives becomes pregnant she remains at Fashoda until the fourth or fifth month, when she is sent to a village, not necessarily her own, where she remains under the charge of the village chief

(*baeng*) until the child is weaned, when she probably returns to Fashoda. She usually takes a number of cattle and servants with her to the village in which she will be confined, and these are generally left there after her departure and become the property of the child, who is invariably brought up in the village where it is born and in which it also should be buried. This rule applies equally to all royal children of either sex. Sons are of course more likely to leave the village in which they have been brought up than their sisters, who, as they grow up, exercise considerable influence in the village.

The Shilluk have a number of age classes, but the organization of these and their significance in the life of the tribe is as yet unknown.

Consanguineous marriages are avoided, the prohibition extending to cousins on both sides of the family as far as the relationship can be traced. The bride price is paid in cattle, and polygamy is the rule, at least for all who can afford it. The bride goes to her husband's house, but usually returns to her parents' *tukl* for the birth of her first child.

A man's property is inherited by his sons, his widows forming part of the inheritance, but no man could marry his own mother.

The Shilluk, though they grow dura, are mainly cattle breeders, wealth and social position are estimated in cattle, sheep and goats are kept, but these are not regarded in the same almost sacred light as cows. Milking is done by boys and old men. In every village there is a common cattle kraal, but, except when the mosquitoes are at their worst, the cattle are tied up for the night in the open in the centre of the village. Fires of dried cow's dung, with the ashes of which the herdsmen smear themselves, are kept smouldering all night. In the dry season when the grass gives out, the young men and boys drive the cattle long distances to fresh pastures, the Shilluk of the White Nile cross to the eastern bank, those of the Sobat migrate to the lagoons to the south of the Sobat.

Fish are speared and trapped and the hippopotamus, the flesh of which is greatly appreciated, is hunted by large parties and harpooned. The Shilluk are not expert trackers, their method of hunting is to drive the game into a large circle and spear those that attempt to escape.

Blacksmiths are not despised, as among the Dinka, and their iron work is good.

The Shilluk are excellent thatchers, the neat appearance of the Shilluk roofs is characteristic, but the best thatches are seen in the royal village of Fashoda, and in the royal shrines in each village.

Besides the dug-out canoe the Shilluk make small rafts of ambatch which resemble the reed rafts of the ancient Egyptians.

*Social Organization and Totemism of the Dinka.*—The Dinka are a congeries of independent tribes spread over a vast area, stretching from Renk in the north (about 300 miles from Khartoum) to within 150 miles of Gondokoro, and reaching many miles to the west in the Bahr el-Ghazal Province. All these tribes call themselves Jieng or Jange, corrupted by the Arabs into Dinka, but no Dinka nation has arisen, for the tribes have never recognized a supreme chief (as do their neighbours the Shilluk), nor have they ever been united under a military despot as Chaka united the Zulu. They differ in manners and even in physique, and are often at war one with another. One of the most obvious distinctions in habits is between the relatively powerful cattle-owning Dinka, and the small and comparatively poor tribes who have no cattle and scarcely cultivate the ground, but live in the marshes in the neighbourhood of the Sudd, and depend largely for their sustenance on fishing and hippopotamus-hunting. Their villages, generally dirty and evil-smelling, are built on ground which rises but little above the reed-covered surface of the country. The members of these poor tribes call themselves Moin Tain i.e. 'Tain people', *tain* meaning a piece of dry ground in the midst of the marshes; and, although many distinct tribes live in the marshes and lead the life this habitat

entails, their cattle-owning neighbours speak of them all as Moin Tain, just as they speak of themselves by their tribal names, e.g. Agar, Bor, Aliab and Twich (Shish). It follows that there has been room for considerable modification in the development of those common ideas which lie at the root of the social organization and religious beliefs of the Dinka.

Each community is largely autonomous under the leadership of a chief or headman (*bain*) who, though primarily a spiritual ruler, controls the village with the help of the elders. The actual authority exerted by the *bain* varies enormously; in many communities he is little more than the local magician, but in one community in each tribe he is the hereditary rain-maker, incarnating the spirit of a great rain-making ancestor, the most important man in the tribe, who is consulted and deferred to on every occasion, and whose wish is law. Except among the Tain tribes cattle form the economic basis of Dinka society; they are the currency in which bride-price and blood-fines are paid, and the desire to acquire a neighbour's herds is the common cause of those inter-tribal raids which constitute Dinka warfare.

The Dinka tribes are divided into a number of exogamous clans with patrilineal descent which the Bor Dinka call *ut*, the Tain and Aliab *gol*, and the Twich *deb*. These words are also used to signify the places at which the cattle of the clan are kept, for each clan of the cattle-keeping tribes has, or should have, its own cattle kraal at its wet-season settlement.

The Dinka are totemistic and the large majority of their clans speak of certain animals as their 'ancestors', *kwar* being the word used by the Tain tribes. Further, *ruai* is used when speaking of the bond between a man and his *kwar*, i.e. they are *ruai*, 'relatives.' No man injures his *kwar* animal, but all respect it in various ways. Sometimes the *kwar* is a plant, as among certain clans of the Agar and Twich, who treat the totem plant with much the same reverence as is commonly shown to a totem animal.

Besides these fairly typical ancestors there are clans whose totems (*kwar*) do not belong to the animal or vegetable

kingdom ; thus the Mai clan of the Bor Dinka have fire as their totem, and in this case there is no story of direct descent from fire. Certain clans have as *kwar*, heroes to whom more than human wisdom is attributed, or who came among them under certain circumstances that betoken that they are superhuman. The clans are usually designated by the names of their (reputed) first human ancestor ; comparatively few are spoken of by the name of their animal, though there is a Niel (snake) clan, and even a Niel tribe among Dinka in the neighbourhood of the Khor Adar.

Most of the Dinka clans whose *kwar* is an animal derive their origin from a man born as one of twins, his fellow twin being an animal of the species which is the totem of the clan. Sometimes the association is not quite so close, in which case the totem animal usually lays certain commands upon one of the members of the clan, offering in return certain privileges. Commands and privileges alike show the close relationship existing between the animal and this man, who is traditionally looked upon as the ancestor of the clan. Although children take their father's totem they respect their mother's totem animal or plant, and an animal may be avoided for several generations for this reason. Further, both men and women usually avoid eating their spouses' totem animal.

Besides the clans with more or less typical totems, certain groups of people, often larger than a clan, revere particular objects which they also speak of as their 'ancestor'. A stone called Madwich, which the Tain say fell from the sky within the past twenty years, is an example of this. The group which reveres Madwich is smaller than a clan, for its cult appears to be limited to members of a part of the Pariak clan (of one of the Tain tribes), whose totem is the snake *niel*. The coming of the meteorite Madwich is said to have been prophesied by a *tiet* (medicine man) called Jalang, who was killed during an Arab raid, and the stone itself was thought to have the powers and attributes of an animal ancestor ; thus, it might make men ill in order that a sacrifice might be offered, and it would communicate its wishes through

a *tiet* in the usual way, asking that a bullock should be killed.

Finally there is evidence that, apart from meteorites and other unusual *kwar*, some of the clans of the Tain Dinka have, or had, more than one totem. The members of the Chiro, Ngong Nyang, and Pariak tribes consider the fish *rechol* an ancestor, telling the usual story that their ancestor was born as a twin of the fish, the latter being taken to the river where he instructed mankind that in spite of the relationship existing between them, they might catch and eat his descendants. There can be little doubt that the relationship still acknowledged as existing between the fish and the members of these tribes is but the shadow of a normal totemic relationship that formerly existed and that still persists in those clans having e.g. the elephant and crocodile as totems.

#### AZANDE AND KINDRED TRIBES

The home of the majority of the comparatively short, mesaticephalic, more or less copper-coloured negroes is to the west beyond the boundaries of the Anglo-Egyptian Sudan, yet most of the tribes living on the rivers flowing northward to the Bahr el-Ghazal belong to this group as do the powerful Azande whose main strength is in Belgian territory. Ethnically this group may be taken to include the Mittu, Moru, Abukaja, Abugaru, Abangbinda, Makraka, Golo, and Bongo (though culturally the two last diverge widely); but even less is known concerning these tribes than about the Nilotes to whom they present almost as sharp a contrast culturally as they do physically.

*Occupations, Clothing, Ornaments, &c.*—None of these tribes are pastoral; agriculture and poultry-rearing are their chief interests. The men are well clothed, their bark cloth garment often being voluminous; the women, on the other hand, wear nothing more than a bunch of leaves before and behind. The hair hangs in plaited locks over the head, and is never worked up into the elaborate head-dresses found among the Nilotes. The lower incisors are not removed, but the frankly

cannibal tribes of this group file the upper incisors to points, or a central V-shaped notch is filed between the upper central incisors. Ivory armlets are seldom if ever worn, although hunting is general, and many Azande chiefs have, or had, considerable stores of ivory. The women of some of these tribes, such as the Bongo and Mittu, wear a circular labret in the upper lip and sometimes also pierce the lower lip and insert a cylinder of quartz or some similar ornament, a practice existing to some extent among the men.

*Organization.*—The Azande are the strongest as well as the most intelligent and well ordered of these mesaticephals, and at the time of the settlement of the country were extending their power northwards, killing and selling into slavery great numbers of the Bongo and neighbouring tribes. The Azande are really a federation of tribes, each with its own divisions and sub-divisions resulting from the immigration some five generations ago from the south-west of four Azande tribes, two of whom even then had not forgotten their older non-Zandeh speech. The Azande territory is at present divided into five districts, each having a supreme head or 'sultan' who must belong to the Avungura, the descendants of Gura their third ruler, who constitute a dominant class having special privileges and rights, e.g. they do no field labour or building, all severe manual work being done for them.

*Territory.*—Schweinfurth estimated the Zande territory at about 48,000 square miles lying between 4° and 6° N. lat., and their numbers at at least 2,000,000. That portion of their country which is included in the Sudan has been called the 'cream of the Bahr el-Ghazal', being rich, fertile, and well watered.

In Schweinfurth's day the Zande territory was divided into many districts. According to him 35 chieftains ruled in these 48,000 square miles, though few of these bore the title of *bya* (king). When the new Sudan Government came into touch with the people they were divided into two main districts, each under its own 'Sultan', namely Tembura to the west and Yambio to the east, between whom there was



frequent strife. Yambio was hostile to the Government and was killed in 1905, his territory being divided among his numerous descendants, of whom Mangi in the Meridi district, in 1911 an old man of 70, was the most important. Tembura was friendly and his numerous sons occupy large districts extending, as it is estimated, over an area of some 8,000 square miles.

*Niam-Niam*.—The origin of the title Niam-Niam, commonly applied to the Zande is almost certainly onomatopoeic to represent the smacking of the cannibal's lips. The word, or variants of it, is applied by Arab geographers to negro cannibals to the South of Mohammedan civilization.

*Character, Arts and Crafts, Marriage, &c.*—All travellers speak warmly of the Azande as intelligent, keen, and well ordered, possessing a relatively advanced civilization 'ages ahead of their neighbours', than whom there are potentially no more important people in the whole of Equatorial Africa. They excel in the arts and crafts generally, their ironwork, wood and ivory carving, pottery, musical instruments, bark cloth and basket work, all attaining a relatively high level. They are polygamous, but the marriage bond is strict and they show much affection for their wives. The women are shy and retiring. The men are skilful trappers and fishermen. They are said to be skilled spearmen, but the iron throwing-knife in its most bizarre form may be called their national weapon, even if its use is only moderately dangerous to the enemy. They make excellent, if excitable, soldiers in the Sudanese army.

The women do the agricultural work and grow excellent root and cereal crops. There are no cattle, the domestic animals being poultry and dogs. All are tobacco smokers and much beer is drunk. Of the Zande, it has been said that the acme of his earthly enjoyments is to eat meat, and their reputation for cannibalism is probably well deserved. According to Schweinfurth they made no secret of it and ate their fallen enemies. To what extent the practice still prevails on warlike expeditions and in the remoter districts is uncertain.

tants of the hills between the White and Blue Niles keep pigs, a practice prevailing nowhere else in the Sudan.

There is, however, this great difference between the two groups of peoples, that the population of the Fung hills, as the *jibal* between the two rivers may be called, have been exposed far more continuously and for a longer period to foreign influence for the most part from the east but also from the west, indeed the country between the two Niles was for some hundreds of years the seat of a typically ephemeral African kingdom, that of the Fung. At its greatest this empire stretched from beyond the Abyssinian border to the neighbourhood of the third cataract, and for a shorter period it included much of Kordofan, while even in its more restricted form its territory stretched from the confluence of the White and Blue Niles to the great swamp area north of the Sobat. Now, however, the province of Dar Fung is limited to the southern portion of the old empire, roughly the area lying between the two rivers between 10° 30' and 12° N.

*The Fung.*—Concerning the Fung themselves it may safely be said that the name corresponds to no ethnic unit, they appear in history towards the close of the fifteenth century as a horde of black soldiers led by one 'Amara Dunkas, who traced his ancestry to the Beni Omayya. He overthrew the Christian kingdom of Alwa, was crowned king at Soba, and made his capital at Sennar. There followed some two centuries of fighting and raiding, especially with Abyssinia and into Kordofan, until by the middle of the eighteenth century—the greatest period of the Fung history—the Fung chronicles boast that settlers came to them from the Hejaz, India, Egypt, and the Far West.

About this time a 'Hameg', one Abu el-Keilik, became vizier and later deposed the king, the Hamegs becoming the real rulers of the land, so that in 1788 one of their number seized the throne. Their rule proved unstable, there were ten kings in 30 years, and when Ismail Pasha invaded Sennar in 1820 the country surrendered without a battle.

From the above account it is obvious that though welded

together as a political unit professing Islam, the Fung were but a conglomeration of Sudan tribes, and this view is borne out by Bruce, according to whom the Shilluk played a predominant part in the composition of the Fung people.

*The Hameg.*—At the present day the inhabitants of the hills in Dar el-Fung are called Hameg by the Arabs, though they usually speak of themselves by the name of their respective hills. With regard to the term Fung, it seems that the word is seldom heard except in the mouth of strangers, yet when used Fung and Hameg seem interchangeable terms. As has been stated the Hameg defeated the Fung, but whether they were really a distinctive people is doubtful. More probably they were only sections from the south, less Arabized than the northern Fung. The word is said to mean 'Ignorant', and is used to indicate slave or vassal, much in the same way as *tigray* is used by the superior tribes among the Tigre-speaking Beni Amer. So called Hamegs are found at Roseires and Fazogli and on Jebel Moya, Jebel Guli, and Jebel Tabi; this is only a fraction of their old territory, in the *Futuh el-Habasah* they are said to extend over a much wider area including territory now occupied by the Base (Kunama).

*Present Representatives of Fung and Hameg: Languages.*—Whatever the precise relationship of Fung and Hameg may be, there is no doubt that their present-day representatives are to be found in the mixed population of the hills between the White and Blue Niles. These form groups of more or less Arabized negroids, who have, however, so far maintained their old habits that they speak non-Arabic languages, while the majority of their customs are frankly pagan. The conditions prevailing on Jebel Guli may be instanced. Jebel Guli is a prominent landmark for many miles. It lies some 300 miles south of Khartum, and 50 miles east of Renk on the White Nile; it is over 1,000 ft. high, and probably has a circumference of about five miles. In the days of the kingdom of Sennar it was the capital of a province, but all that remains of its former greatness are two small settlements of people who call themselves Fung, and appear to be generally known

as Hameg. There are a number of Arabs in both settlements, but though the Hameg (of this hill) all speak Arabic and profess Islam, many of them also speak their old language, and they still keep a number of customs which they admit come to them from their pagan ancestors. Yet their children are growing up to speak Arabic only, and the Guli language is disappearing rapidly. The settlement had been decimated by the Khalifa's forces, and the young men and women had all been killed or taken captive, so that in 1910 the population consisted of elderly men who had escaped the ravages of the Khalifa, and having procured young wives had returned to their villages.

The language of Jebel Guli is spoken on Jebel San and Jebel Roro. Another language is spoken on Jebel Tabi, and it may be assumed that other languages are spoken on other hills, but Arabic is used throughout the province.

*Social Organization.*—Each village has its headman, there are also headmen of groups of villages, while the paramount chief or *nazir* of the district (in 1910 one Idris Wad Regab) bears the title of *mangil* (Jebel Guli), and is considered to be a descendant of the Hameg kings of Sennar.

*Pre-Islamic Practices.*—Remains of the pre-Islamic practices are seen in the cult of the Soba Stone at Jebel Guli. These people say that the great Queen Soba, whom they worship, was their ancestress, but they also apply her name to certain stones which they regard as sacred. The most important of these is a spherical water-worn stone (about 18 in. in diameter) of a brownish colour, with large quartz veins traversing it in every direction. This stone was stated to have been the 'throne' of Queen Soba, and is still the 'chair of kingdom' (*kursi memlaka*) upon which every paramount chief (*mangil*) assumes office. Besides this rock there are two others associated with Soba. Both are weathered boulders, partly embedded in the soil at the side of the track round the base of Jebel Guli. A prayer by a woman at one of these rocks ran somewhat as follows: 'Grandmother Soba . . . permit us to go on our journey and return in safety.'

There was obviously the utmost confusion in this woman's mind between Soba the goddess and Soba the stone on which she had just placed a handful of sand. Soba may also be asked to relieve sickness, and is invoked during a dance held by the neighbours of a recently delivered woman, about the time when the young mother is allowed to leave the house for the first time. Some believe that in the Soba of the Hameg belief there is preserved the memory of such queens as that Candace who ruled the Sembritae of the Gezira in the third century B. C., and of the great city which to the Negroids of the Gezira appeared to dominate the north. When a new *mangil* assumes authority he is inducted by standing on the Soba Stone while his feet are ceremoniously washed, and, when the dura is cut; *merissa* and tobacco are placed on the stone.

*Burun.*—The extreme southern portion of the province and the hills north of the Khor Yabus are inhabited by the Burun, described as a tall black race whose men go naked and whose women wear a small apron. Their northern representatives acknowledge the authority of the *mangil* of Dar Fung; this appears to date back to the time of the Fung Empire.

Knowledge of the Burun is limited to the measurements, notes, and photographs taken by the late Dr. Pirrie on the expedition that cost him his life. He pointed out that the Burun were quite different in their habits and customs from the river Negroids, that they lived in small, widely-separated huts, had no cattle, used the bow and poisoned arrows, and carried throwing-sticks. It seems that in build and physiognomy the Burun nearly approach the Nuba of southern Kordofan, and some of the photographs taken by Dr. Pirrie strongly bear out this view.

## CHAPTER VI

### RELIGION

Mohammedanism in the Sudan—Religion among the pagan tribes of the Sudan.

#### MOHAMMEDANISM IN THE SUDAN

THE absolute simplicity of dogma and rigidity of ceremonial in Islam would seem at first sight to allow little room for a national diversity of development. This uniformity is, however, more apparent than real, for Islam is primarily a living society which embraces every side of the life of its members, and no religion moulds itself more completely to racial and local conditions. Moreover the orthodox tradition of the Sunna, which is guarded by the Ulema or learned men, a class of theologians and canon lawyers analogous to the Jewish rabbis, is not the only side of Mohammedanism. There are also the Sufi mysticism and the cult of the miracle-working saint, which are represented by the religious confraternities and by the independent holy men—fikis or marabouts. Finally there are the apocalyptic beliefs, which form a revolutionary undercurrent throughout the Moslem world and which have led from time to time to an outburst of Mahdist fanaticism.

All these elements are present in varying proportions in the different Moslem countries. The influence of the Ulema is strongest in great Islamic centres, such as Cairo or the Holy Cities of the Hejaz ; it is naturally but little developed among the poor and ignorant Arabs of the Sudan, where the gap between the educated class and the bulk of the population is enormous. The religious confraternities are no doubt powerful here, though much less so than in North Africa. The most important element in the religion of the Sudan is

magical rather than mystical—the cult of Holy Men—Fikis and Walis—living and dead—and faith in their power to avert misfortune and to obtain prosperity by means of amulets, charms, and incantations.

### *Mahdism*

It is, however, by the apocalyptic elements that the religion of the Sudan became famous. Moslem apocalyptic was derived from Jewish and Christian sources, and centres like its predecessors in the idea of a world conflict between the forces of good and evil. The Mahdi—the guided one—of the family of the Prophet will appear to lead all peoples into the way of justice. His coming will be followed by the appearance of Antichrist, El Dejjal, and by other apocalyptic signs. Then the Nebi Isa (Jesus) will descend from heaven, and destroy Antichrist, and the Mahdi will be his Imam. This is the common Sunnite form of the Mahdi tradition and appears to have been that followed by the Sudan Mahdi. There is no evidence that, as some English writers have stated, the latter claimed to be the Shi'ite Mahdi, the pre-existing twelfth Imam.

In all ages of Islam, Mahdis and Isas have tended to appear in times of popular oppression and discontent, and this has been specially the case in North Africa, where the fanaticism and simplicity of the Arab, negroid and Berber peoples, afford good material for agitators and visionaries to work upon.

*The Mahdist Movement in the Sudan, 1881-98.*—The Mahdi, who appeared in 1881, was a native of Dongola, named Mohammed Ahmed, and was born in 1843 or 1848. Though he claimed descent from the prophet, he was usually reckoned as a Dongolawi in race. He became first the disciple of the celebrated Sheikh Mohammed Sherif at Khartoum, whose father Nur El-Dayem and grandfather El-Tayib had been the principal sheikhs of the Sammaniya Tarika in the Sudan. Mohammed Ahmed then established himself on Abba near Kawa. After a time, he was expelled from the Tarika by

Mohammed Sherif, for having criticized him in the matter of the lawfulness of dancing and amusements. He then became a follower of Sheikh el-Ghorashi, of Mesellemia, who was a Khalifa of Sheikh El-Tayib, and head of a rival branch of the Sammaniya. It was at this time that he began his propaganda for the reform of Islam on the strictest lines. On the death of Sheikh Ghorashi, which occurred soon after Mohammed Ahmed had joined him, the latter went to Mesellemia and erected a tomb to the memory of his master, which is still a place of pilgrimage. While here, he was joined by the future Khalifa, Abdullah, a Taaisha Arab from Darfur. He now began to initiate his followers into the secret of his divine mission, as Mahdi, to restore Islam. He undertook several journeys in Kordofan where he won over several important religious sheikhs. In 1881 the authorities at Khartoum became alarmed at his growing influence and an expedition was sent to arrest him, which, however, met with disaster. Mohammed Ahmed now left Abba Island and fled with his followers to Jebel Gedir, where he openly proclaimed himself as Mahdi, and called on all the Arabs to rise. Thenceforward the Mahdist movement grew with astonishing swiftness until it conquered the whole of the Sudan.

The Mahdist movement represented a puritan reform of Islam somewhat similar to Wahabism. The Mahdi likened himself to the Prophet and his followers to the Ansar, the helpers of Mohammed. He had his Hejira (to Jebel Gedir), and his four Caliphs, each of whom represented one of the first four Caliphs of Islam. Conduct was to be reformed on the most rigorist principles. 'Always pray whether you are walking or riding or with your friends. Abstain from all amusements, for through prayers alone can the world be kept in peace. Abstain also from the pleasures of music, do not beat the big and small drums. Put aside everything that has the smallest resemblance to the customs of the Turks and infidels. All their dress, therefore, as well as drums, bugles, and other articles must be put aside : adhere only to the customs of the



Sahaba (the companions of Mohammed). This is now the time to come to God and make a covenant with him. Do not therefore lose the chance by adhering to the love of music.'

All the customs of the Sudanese were also to be sacrificed. Women were to go strictly veiled. There were to be no funeral processions and mourning for the dead; no marriage feasts or large dowries. No wine was to be drunk and no tobacco smoked, the last offence being more heavily punished even than the first. Even riding on horseback was condemned as savouring of worldly pride, and was only to be used in time of war.

The whole energies and thoughts of the faithful were to be concentrated on the Holy War. 'God', said the Mahdi, 'could destroy the infidel without war, but for the honour of his people he wished to carry out his designs through them. It is said that the Turks can be reformed by sermons and preaching. But they can never be reformed except by the sword. The Prophet told me that all nations should be reformed by me. I am created from the light of his heart. He announced to me that my followers are as his followers and that the commonest of them is in the sight of God like Abd el-Qader el-Jilani' (the greatest saint of Islam). 'No nation shall be able to face you in battle, whether of the human race or of the race of jinns. These warriors who have gone forth for the religion of God shall be welcomed by God in the world to come. They shall enter the paradise in which are lofty palaces, chaste wives, and the greatest happiness and prosperity. The creatures of God must die either a natural death, or by the sword, or as martyrs. May God grant that we die as martyrs.'

In another vision, dating from 1883, the Prophet told the Mahdi 'that as I prayed in the mosque of El-Obeid I should also pray in the mosque of Khartoum, then in the mosque of Berber, then in the mosque of Mecca, then in the mosque of Jerusalem, then in the mosque of El-Irak, then in the mosque of El-Kufa. May God grant that we may pray in all these mosques and finally die as martyrs at the hands of the infidels'

The extraordinary confidence of the followers of the Mahdi in this their vocation to conquer the world, is shown by the letters sent by the Khalifa Abdullah, to Queen Victoria, the Khedive, and the Sultan of Turkey, summoning them to repent and accept the gospel of the Mahdi if they wished to escape destruction.

The same asceticism was to govern the followers of the Mahdi in the Holy War as in peace. All women in the camp were to have their own husbands. There should be no private looting, but all spoil in battle should be brought to the Beit el-Mal or public warehouse. This last point caused continual difficulty to the Mahdi and his successor. They were attempting to establish the semi-communism of the first period of Islam. The faithful were to have no dealings in conquered lands, in trade or private wealth. Everything was to go to the common stock, from which the Holy War was financed, and the soldiers were provided for. Thus the Ansar were to be a kind of military caste whose whole life was in war. Any wealthy sheikh tended to be suspect, and the Beit el-Mal was filled by continual confiscations, as well as by plunder.

The followers of the Mahdi all wore a peculiar dress, which included the jibba or *marramia*, a tunic covered with coloured patches, a straw girdle, and a cap with a turban round it. It was on this account that the name of dervish (*darwish*), or religious mendicant, was given to them. By the orders of the Mahdi this name was, however, soon changed for the more honourable one of Ansar, the helpers of the Prophet.

The law and ceremony of Islam was restored by the Mahdi to a state of primitive simplicity, and the distinctions between the four great Moslem sects were abolished. The Confraternities were also discouraged, for what need was there for men to follow the 'Way' of a saint, when the Mahdi himself was there to lead them? The Ansar or Dervishes were, in fact, themselves a kind of great confraternity with their distinctive Dervish dress, and the Mahdi's *rateb* in place of a *dikr*. This *rateb* consisted of a series of texts and

invocations from the Koran and was recited twice daily after the ordinary prayers—a ceremony which occupied not less than 40 minutes.

There is no doubt that the Mahdi—whatever his private life may have been—was perfectly sincere in his efforts towards a national reformation, and in the early days of the movement there certainly was a great improvement in the morals of the Sudanese Arabs, as well as an absolute faith in the religious side of the Mahdi's programme. This soon waned after the capture of Khartoum, and still more after the death of the Mahdi. The direction of the movement passed from the hands of the riverain Arabs and Nubians, the Mahdi's neighbours, to the half-savage Baqqara (Baggara) emirs. The Khalifa himself was a man of great ability and force of character who strove to keep alive the faith in the Mahdi, and the full strictness of his religious programme. The visions and revelations with which he used to inflame the flagging enthusiasm of his followers are, however, on a far lower plane than those of the Mahdi.

*Persistence of Mahdist Fanaticism.*—Nevertheless the latter's death was far from extinguishing the faith of his followers in his mission. A fierce fanaticism sustained them down to the time of their final defeat at Omdurman and Um Debreikat, and was not finally destroyed even by these disasters. Lord Kitchener, in order to avoid the danger of a Mahdist cult, destroyed the tomb of the Mahdi at Omdurman, and scattered his ashes in the Nile ; and the justification of this measure was shown by the fact that even in 1915 the government was obliged to take steps to prevent the Khalifa's tomb being made a place of pilgrimage by the Baqqara. Artin Pasha, writing in 1908, stated that 'in spite of everything the Arabs still revere the memory of the Mahdi and the Khalifa. Had they been victorious it would clearly have been because God fought on their side, and gave them the victory. But they are vanquished and slain—therefore are they martyrs who fell fighting for their God. The people almost adore them ; they hate the enemy whoever he may be, but most of all when he is

a foreigner. The English are spoken of simply as Nasara, i. e. Christians.'

Thus it can be understood how, in spite of the hopelessness of any attempt to shake off British rule, there has been a constant series of outbreaks of Mahdist fanaticism ever since the reoccupation of the country. In many cases these are simply the work of weak-minded fanatics, but sometimes they are due to sheikhs of some education and influence. Of this type was Sheikh Abd el-Qadir, a fiki of Kamlin, who killed the district inspector, Mr. Scott Moncrieff, and afterwards headed a brief rising against the government in 1908. It is characteristic of the religious attitude of the Arabs that before murdering the British official, the Sheikh, not quite truly, declared to him, 'I have no grievance against the Government. What I am doing, I do for Allah, and I will die for Him.'

As a rule the originators of these disturbances claim to be the Mahdi or, most frequently, his successor the prophet Jesus—Nebi Isa. Some are content with simply claiming to be 'the Master of the Age' for the Moslem world, or with declaring war on the infidel, as did Abd el-Qadir.

One of the last of the Mahdist fanatics to appear in the Sudan was a Fellata fiki from Sokoto, named Ahmed Omar, who declared himself to be the Nebi Isa in 1915, in Nuba Mountains Province. He was a man of education and a firm belief in the Mahdi, and he had spent a year in Omdurman on his way back from Mecca. Before his outbreak, he visited the praying place of the Mahdi near Gedir, where he and his followers 'behaved like madmen, running up and down snorting and uttering strange ejaculations'.

It must be remembered that although Mahdism in the Anglo-Egyptian Sudan received a most powerful impetus from the career of the great Mahdi, it has long been a perennial product of Mohammedan Africa, especially among certain West African peoples such as the Fellata (Fula). The latter are to be found scattered throughout the Anglo-Egyptian Sudan, and a large proportion of the Isas and Mahdis who have appeared in recent years have belonged to this people.

These religious outbreaks have hitherto been confined to the immediate following of the fiki, the population as a whole preserving a passive attitude ; but any success on the part of the former might produce a wave of popular fanaticism, and therefore swift action on the part of the authorities is always essential. The most important religious leaders of the country have always shown their disapproval of the fanaticism of the fikis, and have given their support to the government. In 1905 Sir R. Wingate testified to the value of the assistance he had derived from the body of educated and enlightened Ulema and religious leaders, and stated that whilst these admitted that the general improvement in the lot of the people tended to lessen the danger of any widespread recurrence of fanaticism, they nevertheless considered that the superstition and ignorance which pervaded the mass of the population rendered it imperative on the government to take every possible precaution. The danger is greatest every year towards the close of Ramadan, when the tension of the long fast and the atmosphere of religious excitement produce ready material for agitators or fanatics to work on.

Religious fanaticism, though not of the Mahdist type, seems also to have been responsible for the late Sultan of Darfur becoming openly hostile to the Sudan Government. As he grew old, he had devoted himself more and more to his religion. He declared that he had been chosen to be a Father of the Moslem in these times, to re-establish the ruined monuments, and to restore the Law of the Prophet ; and he refused to have any dealings with the infidel British and French Governments to east and west of his kingdom.

### *Religious Confraternities*

It is difficult to estimate the importance of the part played by religious confraternities in the religious life of the Anglo-Egyptian Sudan, but it is no doubt very great. The religious confraternity or *tariqa* occupies a place in Mohammedanism somewhat between a sect and a religious order. Like the latter they are not mutually exclusive, and each *tariqa* com-

bines considerable jealousy of its rivals with a great veneration for the teachings and persons of the different founders ; like the former their membership extends to every class and occupation, and each body has its own peculiar tenets. While the early Asiatic confraternities were true religious orders, in North Africa, and especially where they are in contact with a negroid population, they have developed great missionary activities and tend in some cases to become sects. They all agree in the idea of an esoteric religious system which they have inherited from the great Sufi teachers who were the founders of the earliest confraternities. Their aim has often been defined as ' the annihilation of the soul in God ', and this goal is reached by ascetic, mystical, and magical practices, which differ in each confraternity. While some of them set a small value on external practices and recommend contemplation and prayer, the majority trust chiefly to auto-hypnotic practices, such as the control of respiration, rhythmical invocations combined with motions of the head and the body, or dancing, and a considerable number are mere wonder-workers and jugglers. The Nakshabandiya, amongst others, includes both methods, the followers of the one being called Batheniya—interiorists—and those of the other Zaheriya—exteriorists.

The essence of membership in a confraternity, however, consists not so much in the practices followed as in communion with the holy sheikh who originated the particular order. The *Baraka* or benediction, which includes the miraculous powers and spiritual efficacy of sainthood, is not only inherent in the saint, but is transmissible, in some orders to his descendants, and in others to his spiritual representative. The postulant is admitted to a participation in this blessing and in the merits of the founder by the *wird* or initiation which is conferred by the hand of the sheikh or of his representative, the *mokaddem*.

The ordinary member of a confraternity, who is known as Khouan in North Africa, Darwish in Turkey, and Fiki in Arabia and the Sudan, has an unbounded veneration for and

dependence on his religious leader. 'Be in the hands of thy Sheikh like a corpse in the hands of him who prepares it for burial,' says the rule of one of these confraternities. 'He is superior to all other creatures, and takes rank after the Prophets. Banish from thy heart every thought which has not God or the Sheikh for its object.' Another says, 'In his relations with the Sheikh the Murid (disciple) ought to put off his own will, and only dispose of his person and his property according to the judgement and instructions of the Sheikh.' These instructions are nowhere more completely carried out than among negroid Mohammedan peoples, to whom in some cases the head of a confraternity is little less than a human god.

Thus it has come about that in a religion which has no priesthood or regular clergy an hereditary order has arisen possessed of an intrinsic sanctity and authority far transcending anything found among Christians. They are in fact saints, magicians, priests, and temporal leaders.

With regard to religious practices there is of course wide difference both between the different tariqas and between the professional dervish and the ordinary 'lay' adherent. The one universal practice is the recitation of the *dikr*, a species of litany in which the names or attributes of God are repeated many hundreds or thousands of times. Each confraternity has its own peculiar *dikr* in the spiritual efficacy of which the members have an extraordinary confidence. The formula, 'la illaha ill'Allah,' there is no god but God, forms in every case the main invocation. The *dikr* is repeated either alone or in chorus, each word being accompanied by the bowing and turning of the head and the swaying of the body. In the more ecstatic sects these movements are gradually accelerated, while the invocation is shortened to a single syllable such as Hu or La, so as to produce a state of trance.

Many tariqas enjoin ascetic practices, such as fasting, complete solitude, and privation of sleep, while others inculcate charity and good works.

A confraternity may have a *kherga* or habit, or be noted

by the colour of the turban ; but not even this is much observed in the Sudan.

In a country like the Sudan, membership of a confraternity no doubt usually involves no more than the recitation of the *dikr* and veneration for the sheikh of the order, but there are, nevertheless, some who devote their whole lives to religious practices, and these may sometimes be men of position and influence. Thus a noted *fiki* of the Qadriya confraternity, who died at Omdurman in 1917, had lived a life of religious retirement for 20 years, and had daily fed large numbers of the poor at his house. On the other hand, there are many professional *fikis*, who make their living by the sale of amulets, love charms, &c., and who are hardly more respectable than the negro magician whose place they have taken.

The esoteric principles and the popular prestige of the confraternities have naturally earned for them the disapproval or even the open hostility of the official leaders of Islam, the Ulema. Nevertheless, Sufi mysticism has long occupied an unassailable position in orthodox Moslem theology, and the founders of the old confraternities, whose principles every new religious order invokes, are amongst the most famous and popular of the saints of Islam.

With regard to the relation of the confraternities to the secular power, no general statement can be made. In most Moslem countries there is a member of the Ulema, the Sheikh El-Turuq, who has the duty of supervising them, but no close control is attempted.

Some of the great orders, notably the Senussiya, are notoriously anti-European, but as a rule their political attitude depends on the sheikh who directs the local branch. In the Egyptian Sudan the attitude of the Mirghaniya, the most important confraternity, has always been friendly to the government, and the Mahdi found the leaders of nearly all the tariqas, including the Senussiya, hostile to his claims. His successor, the Khalifa Abdullah, consequently attempted to suppress the Tijaniya and all the other tariqas except the Mahdi's own. This attitude on their part is comprehensible



enough. Wealthy and influential religious sheikhs naturally preferred their position under a foreign government, when they became the natural leaders of the people, to the secondary rôle that they would occupy under a militant theocracy. Nevertheless, a confraternity naturally tends to be fanatical, and the smaller religious leaders who have little to lose are liable to be carried away by religious enthusiasm, and to misuse the influence which they possess over their followers.

The most important confraternities of the Sudan trace their spiritual pedigree back to Sayed Ahmed ben Idris, one of the greatest Mohammedan teachers of modern times. The latter was a native of Fez and a leader of the Khadyriya tariqa, who established himself at Mecca about 1799. Owing to the hostility of the Ulema, he was eventually forced to take refuge with his disciples at Sabia in Asir, where he died in 1837. He seems to have differed from other founders of confraternities in that he was a religious reformer rather than a mystic, and the activities of his followers were of a propagandist and missionary character.

*The Mirghaniya or Khatmiya.*—On his death there was a schism among his followers, one party following the famous Sheikh Senussi, who had taken *wird* from Sheikh Idris in 1823, the other and larger party following Sheikh Mohammed Osman el-Amir Ghani or Mirghani. The latter had visited the Sudan during the lifetime of Sheikh Idris, and had passed through Nubia, Kordofan, and Sennar to Suakin. He had been specially successful in converting the Nubians of Dongola, and the Beni Amer between Suakin and Kassala. On becoming the head of the tariqa, he sent one of his sons, Sayed Hasan, to the Sudan, who took control of the movement in those regions, and settled at Dongola. After the death of the first Mirghani, the tariqa split into several independent sections, the eldest son, Mohammed Sirr el-Khatim of Mecca, being unable to secure the allegiance of his brothers. S. Hasan retained the leadership of the tariqa in the Sudan, and was succeeded by his eldest son, Sayed Mohammed Osman Taj el-Sirr, who established himself at Kassala,

while his younger brother, S. Ahmed el-Hasan, remained in Nubia. Meanwhile, the family of Sheikh Idris of Sabia, who had retained their connexion with the Senussi, began to revive the influence of the original founder in the Sudan. Sheikh Abd el-Mutaal, the son of Sheikh Idris, established himself at Dongola, after completing his education with the Senussi at Jerbub. On the death of Sayed Hasan, he broke with the son Sayed Ahmed, and set about the reconstitution of the Idrisiya Tariqa among the Danagla. In this he met with great success, and on his death his tomb became one of the most important religious shrines in the northern Sudan. A festival, the Holia, is held in his honour on October 9 every year.

The head of the Mirghaniya of the Hejaz also sent his younger son and namesake, S. Mohammed Sirr el-Khatim, to Africa about this time. The latter, after spending some time in Nubia, finally established himself at Cairo, as head of the order in Egypt, leaving a cousin, Sheikh el-Mahjub, as khalifa or vicar in Dongola. When the Mahdiya broke out, all the leaders of the Mirghaniya, excepting this Sheikh el-Mahjub used their whole influence to support the government. S. Mohammed Osman headed the Beni Amer and the Shukria in their resistance to the Dervish armies, and finally fled with his sons, Sayed Ali and Sayed Ahmed, from Kassala to Suakin and Cairo, where he died in 1886.

S. Mohammed Sirr el-Khatim also used his position to assist the government, and his elder brother, S. Abdallah el-Mahjub, the head of the elder branch of the order, came from the Hejaz to Suakin to assist in Mohammed Osman's movement against the Dervishes. After the re-occupation of the Sudan, S. Ali and S. Ahmed, returned to their father's home at Kassala, where they succeeded in restoring to the full the influence of their confraternity, which now enjoys a period of exceptional prosperity. Sayed Ali, the head of the family, has been made K.C.M.G. by the British Government in recognition of the services of his family and his personal loyalty. He possesses a house at Omdurman as well as at Kassala, in the Khatmiya suburb south-east of the town, where the chief Mirghani

mosque is situated. A recent observer writing of the influence of the family says, 'They are treated by the natives with a reverence that comes akin to worship ; crowds follow them when they ride abroad ; the common herd kiss the hem of their garments ; to be given a hand to kiss is a privilege reserved for the elect, and a mark of high favour.' S. Ali remains in close relations with the other members of his family, S. Jaafer, the head of the Eritrean branch, and S. Abdallah el-Mahjub, who was, at least until recently, the head of the order in the Hejaz. A son of the latter, S. Ibrahim Mahjub, died at Halfa in 1908, while on a visit to the Sudanese branch, and his cousin, S. Ali, proposed to build a tomb and mosque there in his honour. The former head of the Egyptian branch, S. Mohammed Sirr el-Khatim, died at Cairo in 1915.

*The Ahmediya (Idrisiya).*—During recent years the Mirghaniya confraternity has been extending its influence in Nubia at the expense of the Idrisiya, and there has been some friction between the two orders in consequence. The Idrisiya is more usually known as the Ahmediya, but appears to have no connexion with the great Ahmediya or Bedawiya order, which has its centre at Tanta in Egypt. The Idrisi family of Dongola is closely connected with the original branch of the family in Asir. It appears that the present head of the confraternity in Dongola, Sheikh Idris, belongs to the family of Abd el-Mutaal.

The head of the Arabian branch, S. Mohammed ibn Ahmed Idris, however, also possesses considerable influence in Dongola. He was born at Sabia in 1876, and educated partly with the Senussi at Kufra, but mainly at the expense of his kinsman, Abd el-Mutaal of Dongola, at the El-Azhar mosque at Cairo. After eight years there he removed to Dongola Province, where he married, and where in 1904 his neighbours subscribed to build him a house on Artigashi Island. In 1905 he returned to Arabia and began his struggle with the Turks for the independence of Asir. He was joined in 1913 by his family from Dongola. He is generally known in the Sudan as Mohammed el-Yemeni, and is said by a favourable witness,

to be a man of great learning, simple in his mode of life, and very strict in religious matters, following sternly the precepts of the prophet. He is much opposed to the multiplication of sects. He is said never to collect money from the people at the mosques, and has spent much time in examining fikis, and endeavouring to remove their superstitions. He professes great admiration for British rule in the Sudan, and is naturally very anti-Turkish. He is a popular man in Dongola Province.

In the summer of 1916, S. Idris, the son of Sheikh Abd el-Mutaal, whilst visiting Omdurman to celebrate the anniversary of the founder of his tariqa, had an interview with Sir S. Ali, the Mirghani, in order to discuss the mutual relations of the two confraternities. No information is available as to the tenets and practises of the Idrisiya. Those of the Mirghaniya are said to be based on the teaching of the four fundamental orders, the Qadriya, the Naqshabandiya, the Shadeliya, and the mystical Joneidiya. They recommend constant prayer, abstinence, and silence. They recite their *dikr* in common, bowing the head and body, and gradually shortening the invocations to Allah or Hu, but they do not indulge in the more violent practises of physical ecstasy.

They are remarkable for the emphasis which they place on the hereditary character of the *baraka* and sainthood of their founder, and for their implicit belief in the sanctity of all his direct descendants. This hereditary power they name *Sirr el-Khatim*, or the secret of the seal, whence the order itself is often known as the Khatmiya. They are also a very exclusive order, not permitting their members to affiliate themselves to other tariqas.

*Other Confraternities.*—A third confraternity, founded by a disciple of Ahmed ibn Idris, the *Rashidiya*, is also found in the Sudan. Its founder, Sheikh Ibrahim el Rashidi, belonged to the family of the founder of the Algerian Rashidiya, which was a branch of the Shadeliya. After vainly attempting to revive this order in Egypt, he settled in Mecca, where he carried on the tradition of his master, S. Idris, and acquired great influence among the pilgrims, especially the Indian

Mussalman. He died in 1874. His confraternity is an important one in India and the Hejaz, and is also represented in the Sudan and in Somaliland, where it is said to be the tariqa to which the Mad Mullah belongs. The Shaigia at Merowe belong to this confraternity, and it also has adherents at Omdurman.

The *Senussiya*, in spite of their connexion with the Idrisi family, appear to have very little importance in the Anglo-Egyptian Sudan. They have had some influence in the extreme west of the Bahr el-Ghazel Province and in Darfur, but Sultan Ali Dinar feared the power of the Senussi, and refused the requests of the latter that he might establish a *zawia* of the order in Darfur.

In 1911 there was a considerable influx of Senussite (Tuareg) refugees from Wadai into Darfur, but they met with ill-treatment, rather than help, at the hands of the Ali Dinar. At present they are settled south of El-Fasher. Their khalifa is Abu Bukr el-Ghadamsi. It was only when Ali Dinar had resolved on hostilities with the Anglo-Egyptian government, that he attempted a rapprochement with the Senussi, and permitted a Senussite establishment north of Jebel Meidob.

The Guraan, on the north-west frontier of Darfur, are under Senussite influence, and in 1917 were under the leadership of Mohammed Erbeimi, a well-known Senussite leader.

The *Sammaniya*, an offshoot of the Egyptian Bekkriya, is among the more important of the tariqas of the Anglo-Egyptian Sudan. This order possessed celebrated leaders in Sheikh Nur el-Tayib and his son and grandson Nur el-Dayem and Mohammed Sherif of Khartoum.<sup>1</sup> One of Nur el-Tayib's khalifas, Sheikh Ghorashi of Mesellemia, founded an independent branch of the order which was continued by his son. These tariqas are especially strong in the Gezira, where they possess numerous *khelwas* (strictly, 'retreats') or schools for religious teaching.

<sup>1</sup> The latter was the original teacher of the Mahdi. His son Abd el Majid Nur ed Dayem had his khelwa on the White Nile, opposite Um Arda island.

The *Qadriya*, the most widespread and decentralized of all the Moslem orders, is also well represented in the Sudan, and the tomb of one of their former leaders (Sheikh Abu Asha), at Abu Haraz on the Blue Nile, is among the chief places of pilgrimage in the territory.

The *Shadeliya* and the *Tijaniya* also have followers in the Anglo-Egyptian Sudan.

The existence of a small *tariqa*—the *Awazma*—which professes Wahabi principles regarding the unlawfulness of mourning for the dead, building tombs, and venerating saints, has recently been noticed in the Red Sea province. Its leader, Sheikh Mohammed Madi, a teacher at Gordon College, was deported to Egypt about 1915. His representative at Suakin was condemned as a heretic by the khalifas of the other confraternities in 1913.

Another peculiar confraternity, which has acquired the character of a true sect, is that of the *Jemaat Abu Jarid* or *Zabala'a*, i. e. 'deceived ones' as they are usually called. Their numbers are now small and they are confined to Sennar Province and Butana. They belong chiefly to the *Kenana* and *Shukriya* tribes.

The founders of the sect or confraternity, Sheikh Abekr and his disciple Abu Jarid, lived in the first half of the seventeenth century, at a time when the Mohammedan Fung kingdom of Sennar was at its height, and when there was considerable religious activity in this part of the Sudan. According to the *Zabala'a* themselves their principles and practices are based on those of the *Shadeliya*, and have nothing heretical about them. Their critics, on the other hand, accuse them of recognizing no prophet besides Abu Jarid, and of indulging in sexual promiscuity at their *dikrs* and religious meetings. Though in all probability there is no truth in these accusations, they do form a distinct society, marrying only amongst themselves and avoiding all intercourse with others, a fact which marks them off from the ordinary religious confraternities of the Sudan.

Their *dikrs* are held twice a week as well as on festal occasions. On these occasions those who fall into a trance speak

with tongues, and this mysterious language is called ' hayut ', and is believed to have been taught to Abekr by the angels.

The leaders (khalifas) of the sect are descendants of the original founders, Abokr, Abu Jarid, and Kiren, and are held to be great miracle-workers. The present leader of the sect, the Khalifa of Abokr, is named El-Sherif el-Imam ibn Busati, and lives at Hillat el-Giwezat in Singa district.

### *Popular Mohammedanism*

The actual religion of the majority of the people centres above all in the cult of holy men (fikis), both living and dead.

The aid of the fiki is invoked in every necessity, and he presides at all the important social ceremonies.

Among the riverain Arabs of the northern Sudan every clan believes in some Holy Man to whom gifts are made on the occasions of the shaving of children's heads after birth, their circumcision, and at marriages.

Vows to a dead holy man (a wali), and pilgrimages to his tomb are practised throughout the Sudan, and earth from such tombs is much esteemed as a charm. Childless and unmarried women make vows to walis to obtain the fulfilment of their desires.

All misfortunes to which men are liable—disease, madness, childlessness, failure of crops, and all kinds of ill luck—are held to be due either to the evil eye or to evil spirits. These are guarded against in the first place by charms and amulets, which are provided, usually at a very high cost, by the professional fiki. The written charms (*ketab*) usually consist of chapters from the Koran, but the writings of the saints, for example the Mahdi, are also employed, and magical signs and diagrams are very popular. Certain stones and roots are also commonly used as amulets.

In any serious need, especially illness and madness, the personal intervention of a *fiki* is called for. The simplest methods of cure, and those most in use, are by prayer and the laying-on of hands, or by expectoration, but serious ills such as diabolic possession require much more elaborate and costly

exorcisms. The power and reputation of the fiki depend no less on his descent than on his personal sanctity, sherifs or descendants of the Prophet being of course especially gifted. The Fellata, who are found in almost all parts of the Sudan, have also a high reputation as a people of fikis. They have a peculiar system of divination by sand-gazing.

### *Expansion of Islam in the Sudan*

The whole previous history of the Sudan has been one of Mohammedan and Arab expansion at the expense of the pagan negroids, and since the British reoccupation this religious development has continued, and has perhaps been accelerated. Previously the progress of Islam was due to the formation of Moslem States, such as Darfur and Wadai, and to the slave trade, which caused the pagan populations to recede constantly ; this has now given place to a no less effective peaceful penetration. Civilization in the Sudan, coming from Egypt, has acquired a Mohammedan stamp, and the progress of civilization carries the predominant religion with it.

*Spread of Mohammedanism among the Negroes.*—The establishment of every new government post in the heathen south brings into the country Moslem traders, soldiers, and officials, all of whom carry on a certain amount both of conscious and unconscious propaganda. The higher social prestige of Mohammedanism causes it to be eagerly adopted by the heathen recruits in the army, and by natives recruited for government labour. If these afterwards return to their villages and relapse into their old way of life, they will at least retain their Mohammedan amulets, and will continue to swear by Allah and to be ashamed of the religion of their ancestors. Circumcision, which is practically always undergone by pagan recruits to the Sudanese battalion, marks a man as a Mohammedan for the whole of his life, and the natural tendency of the negro to ape the externals of a higher civilization causes him often to adopt the turban or the tarbush, and to scar his cheeks like an Arab. Moreover, in those parts of the Sudan which are farthest removed from the influence of the



government, such as the western Bahr el-Ghazal and the outlying parts of Darfur, the profession of Islam and the use of Arabic marks the chiefs and the leading men amongst an otherwise pagan or semi-pagan negroid population, and these naturally exercise a leavening influence on their subjects.

*Lack of Influence of Christian Missions.*—Apart from the resisting force of pagan custom this expansion of Islam is practically unimpeded. Christian missions are, it is true, permitted to work among the pagan tribes of the southern Sudan, and Presbyterian, Roman Catholic, and Anglican missionary societies have for many years been at work among the Shilluk on the White Nile and among the tribes of the Bahr el-Ghazal. Their work amongst these peoples, however, is necessarily more social and educational than religious, and it cannot at present be considered as a serious rival to Moslem propaganda among the negroid population of the Sudan. Moreover, the Mohammedan possesses two overwhelming advantages over the European missionary: the law of his religion involves no drastic break with native custom with regard to marriage and polygamy; and by race and civilization he is close enough to the negro to exercise a strong social influence upon him.

*Influence of the Pilgrimage.*—Another important factor in the development of Islam in the Sudan is the proximity of the country to the focus of Islam—the Holy Cities of the Hejaz. The Pilgrimage, which everywhere plays so large a part in Mohammedan life, is here doubly important. For centuries a large volume of pilgrim traffic from the central, and even the western Sudan, has passed through the territory. One route passes north-east through Dar Fertit and Darfur and across the Libyan Desert into Egypt, another passes through Kassala to the Eritrean ports, whilst the third leads from Kassala or Omdurman to Suakin. The construction of the Sudan Government railways has caused an increasing proportion of the traffic to follow the line El-Obeid-Khartoum-Suakin, and in normal years from 3,000 to 6,000 pilgrims leave the latter port for Jeddah.

The pilgrims naturally consist of the most devoted Moslems of the Sudan, and even their passage through the country has some effect on the inhabitants. Still more important, however, is the fact that a considerable number, on their return from Mecca, elect to settle down permanently in the Anglo-Egyptian Sudan. The pilgrims consist of Fellata and Hausas. The Fellata are especially given to settling in the Egyptian Sudan, and colonies of them are found in many parts of the country, particularly in Kassala and Sennar Provinces. Some of these settlers are led by men of importance—for instance, a brother of the Sultan of Bornu was permitted by the Government in 1914 to start a Fellata settlement on the River Dinder. The Arabic-speaking Fellata, who have been some generations in the country, are, as a rule, very fanatical and have been much affected by Mahdism.

Omdurman, the only great town east of Lake Chad, is already an important half-way house between the Hejaz and the central Sudan, and possesses a considerable floating population. With the improvement of communications with Darfur and the west, its importance as a Mohammedan centre will continue to grow. Already the most important religious sheikhs (i. e. heads of confraternities) have their head-quarters, or their representatives, at Omdurman, and in some cases religious leaders from outside the territory have settled down there. Thus in 1916, there died at Omdurman an influential Hausa sheikh, Omar Gambo, with a great reputation for piety, who had established himself there, after living for some time at Mecca where he had maintained close relations with the Sudan.

### *Religious Policy of the Government*

The Government has consistently followed a policy of the widest toleration towards Islam—a policy which was summed up by the Governor-General in his speech to the Ulema on the outbreak of the European war in the following words: ‘God is my witness that we have never interfered with any man in

the exercise of his religion. We have brought the Holy Places within a few days' journey of Khartoum. We have subsidized and assisted the men of religion. We have built, and given assistance for the building of, new mosques all over the country. Finally the Kadis and others have received a free and thorough education in the Koran and in the tenets of the Mohammedan religion.' Whilst the Government so far as possible follows a policy of non-interference, it is impossible in a Mohammedan country to separate the secular from the religious side of life. A board of Ulema has, therefore, been established at Omdurman to advise the Government on all questions in which religious feeling may be involved.

Questions of personal status such as succession, wills, gifts, marriage, divorce, family relations, and also the constitution of charitable endowments (waqf) are tried in accordance with Moslem law by special courts (Mekhema Shariya). (See 'Justice', p. 292.)

The judges of these courts are Mohammedan sheikhs, either natives of the Sudan or Egyptians, the latter trained at El Azhar Mosque, Cairo. Though the majority of the inhabitants of the Sudan are Malikites, the courts generally, as in Egypt, follow the Hanafite school of Moslem law. There is a training school for Mohammedan law in conjunction with the training school for teachers at Gordon College. In 1914 Sheikh Mohammed Mustafa el-Maraghi was Grand Kadi.

The Government provides for part of the cost of the erection of new mosques. In 1908 the total number of public mosques was 339, and several new ones have been opened annually since that date. There were also 134 private mosques. A very large proportion of the total were situated in the three northern provinces especially Dongola. The Imams of the mosques, the muezzins and the mosque servants are paid either by the Government, by the subscriptions of the faithful, or by the proceeds of religious endowments.

The chief festivals, which are treated as public holidays and receive government recognition, are the Birthday of the Prophet, Mulid el-Nebi, approximately on the 12th of Rabi

el-Awal, Little Bairam or Id el-Sughaiyar, which occupies the three days after the close of Ramadan, and Kurban Bairam or Id el-Kebir, on the 10th to 12th of Zilhigga, when every family kills a sheep in commemoration of the sacrifice of Abraham. The opening of the Mohammedan year (1st to 10th Muharram) is also a festal season.

### RELIGION AMONG THE PAGAN TRIBES OF THE SUDAN

The basis of the religion of all those negro and negroid tribes of the Sudan concerning whom we have any knowledge may be said to be the cult of the dead. It should, however, be noted that, so far as this statement applies to the non-Nilotic tribes, it is based on hints scattered through literature. It is only when we come to the Nilotic tribes that any definite statements can be made, and here we find that a considerable difference exists between the various tribes which perhaps may in the future be correlated with the presence or absence of totemism, or, at any rate, of various animal cults.

Apart from the cult of the dead, most Sudanese blacks, whether negroes or negroids, have a belief in the existence of a high god, frequently of a more or less otiose nature. Broadly speaking, he concerns himself little with the affairs of mankind, the regulation of which is held to depend on man's own efforts seconded by the spirits of the dead, whose benevolent interest is invoked by prayer and sacrifice.

The Shilluk, of whose religion we perhaps know more than of that of any other tribe, afford the classical example of the belief in a divine king. It is probable that they, or some of the stock from which they arose, were at some time totemic, but this side of their socio-religious organization has been overshadowed by their belief in a divine king, in much the same way as we may assume that the primitive Egyptian belief in local animal gods was changed when the country was unified under the early dynasts, who came to unite in

their own person many of the sanctions and sacred attributes of the earlier cults.

Where the divine king is somewhat less prominent than among the Shilluk, for example, where he is not ceremonially killed, it will probably be found that something of the sort once occurred. The discrepant accounts which we have as to the fate of the rain-makers of the Bari certainly support this idea, while the rain-makers of the Dinka, as will be seen later, afford an example almost as classical as that of the divine king of the Shilluk.

As regards the relation of the high god to totemism, the totems are on a totally different plane, and the two beliefs do not seem in any way to clash; moreover, the belief in animal ancestors and all that it implies, fuses so readily and logically with the cult of the dead, that the two beliefs do not exert any mutually disintegrative action, but rather tend to reinforce and perpetuate each other. The usual beginning of a Dinkæ prayer, *Nyalich ko kwar*, 'God and our ancestors' (to which further reference is made later), is an excellent example of this. The high god is first mentioned, but it is the ancestors who are propitiated and invoked, indeed feared, in everyday life, and it is to them that shrines are raised. Moreover, even Dengdit, the high god, is believed by the Niel Dinka to have ruled the tribe in human guise long ago, and the Adero clan of this tribe have the rain (*deng*) as their totem.

The almost complete absence among the Nilotic tribes of human sacrifice and of the cruelty which in Africa usually accompanies it, is probably to be attributed to the modification of the original negro stock by incoming Hamitic blood. It is at least a fact that, proceeding westwards, it is not until the Nile-Congo divide is reached that mass human sacrifice accompanies the death of a sovereign. Among the Azande we get the first glimmering of West African habits, the tomb of the Azande king being carpeted with the living bodies of his wives, whose limbs have been broken in order to prevent their escape.

*Dinka Religion*

The Dinka are a deeply religious people. They worship a high god Dengdit, lit. 'Great Rain', sometimes called Nyalich, and a host of ancestral spirits called *jok*. As already stated, the common beginning of the prayers of the Tain and Bor Dinka is *Nyalich ko kwar*, 'God and our ancestors,' i. e. the ancestral spirits. This phrase indicates the two main elements of their religious faith, and their relative importance, for there is no doubt that Dengdit (Nyalich) is greater than the *jok*. It was he who created the world and established the order of things, and it is he who sends the rain from the 'rain place' above, which is especially his home, and in regard to this matter he must be directly approached by the rain-maker of the tribe, who in each generation incarnates the spirit of the great ancestral rain-maker. Nevertheless, in the ordinary affairs of life the ancestral spirits are appealed to far more than Dengdit, and in some cases in which the appeal is nominally made to Dengdit its form seems to imply that he has been confused with the *jok*.

It will be convenient to consider the worship of Dengdit and the cult of the *jok* separately, though it must be realized that they constantly touch, and even overlap each other. The Southern Dinka (to whom the following specially refers) do not appear to use set forms of prayer, but to ask in ordinary simple sentences that their immediate wants may be granted. They also have a number of hymns which are sung when an ox is slaughtered to avert drought or sickness, but men also sing them when doing light work, and lately during a severe thunderstorm every one joined in lustily to appease the elements.

Offerings were made to Dengdit at certain shrines—perhaps they might be called temples—which seem to be scattered all over the Dinka territory. Most Dinka tribes appear to have one shrine in their territory, and this is certainly the case among the Shish and Agar. At Luong Ajok near Rumbek there is a hut bigger than an ordinary *tukl* which is

surrounded by a fence. This is called *luak* (not to be confused with the cattle *luak*). It is not a tomb, nor has any one been buried near it. The door is always shut and may not be opened even by the *bain*, the high priest of the shrine and the rain-maker of the tribe, unless a sacrifice is made and milk is scattered in front of the door. In the shrine at Luong Ajok there are stools said to be of copper and brass, shields, spears, sticks of rhinoceros horn, and a number of clay pots. All these belong to Dengdit who long ago came to earth bringing them with him. One morning the people found the *luak* built and the stools and other things inside it, and decided that Dengdit alone could have done this and that it was his place. The great central rain-making ceremony of each tribe takes place at one of these shrines, as does the harvest ceremony held after the cutting of the dura; here too the Agar install their new rain-maker.

The nature of the rain-making ceremony, probably the most important religious ceremony of the Dinka, will be best realized by means of a condensed account of information obtained from Biyordit, an old but still active man, the rain-maker of the Bor tribe, who has the greatest influence over the Bor and neighbouring Tain Dinka. In each of the eight rain-makers who preceded Biyordit there was immanent a great and powerful spirit called Lerpiu, now immanent in Biyordit, who says quite simply that at his death Lerpiu will pass into his son. Near a hut belonging to Biyordit there is another constituting a shrine, in which the *jok* of Lerpiu is thought to reside more or less constantly. Within this hut is kept a very sacred spear also called Lerpiu, and before it stands a post called *rit*, to which are attached the horns of many bullocks sacrificed to Lerpiu. Behind the hut there is a bush of the kind called *akoi*, which must not be cut or damaged in any way, but which strangers are allowed to approach without the least ceremony. The *akoi* bush is clearly the least sacred part of the shrine, yet its presence is essential, for the *jok* leaves the hut to come to the *akoi* during the great rain-making ceremony, and the slight sanctity of

the *akoi* at other times is well explained by the absence of the *jok*.

The rain ceremony consists of a sacrifice to Lerpui to induce him to move Dengdit to send rain. It is held in the spring (about April) when the new moon is a few days old. In the morning two bullocks are led twice round the shrine and are tied to the *rit* by Biyordit who kills them later. While the sacrifice is being prepared, the people chant ' Lerpui our ancestor, we have brought you a sacrifice, be pleased to cause rain to fall '. The blood is collected in a gourd, transferred to a pot, put on the fire and eaten by the old and important men of the clan. Part of the flesh of one bullock is cooked with much fat and left near the *akoi* for the *jok*. The bones of the sacrifice are thrown away, but the horns are added to those already attached to the *rit*.

Besides the great rain-making ceremony performed at a central shrine, some tribes offer a sacrifice for rain in each settlement.

The rain-makers of the Dinka are called *bain* (the term also applied to village chiefs); in each there is immanent the spirit of a great ancestor that has come down to him through a succession of rain-makers and ensures that he is far-seeing, and wiser than common men. No rain-maker is allowed to die of old age or as the result of chronic lingering illness, for, if this occurred, sickness would attack the tribe, there would be famine, and the herds would not yield their increase. A rain-maker who feels that he is getting old and infirm tells his children that he wishes to die. Among the Agar Dinka a large grave is dug and an angareb is placed in it upon which the rain-maker lies without food or drink for many hours, generally for more than a day. From time to time he speaks to his people, recalling the past history of the tribe, how he has ruled and advised them, and instructing them how to act in the future. During this time he takes no food, at last he tells them he has finished and bids them cover him up; earth is thrown into the grave and he is soon suffocated. This applies specifically to the Agar Dinka, but there is no



doubt that with minor variations it holds good for all the Dinka.

The soul or spirit is called *atiep* ; it may leave the body in sleep, indeed its wanderings are the common source of dreams. The *atiep* of a father, mother or ancestor may at any time ask for food in a dream (Tain). If an offering were not provided the *atiep* might, and probably would, make the dreamer or his wife or children ill. It was moreover stated that the customs observed after death, especially the death feasts, were held to propitiate the *atiep* of the deceased and to prevent it from sending sickness or misfortune to the survivors. Sometimes the spirit of a person recently dead is spoken of as *jok*, but the term is generally reserved for the spirits of long dead and powerful ancestors.

The *jok* know when a child is born and protect it from the very beginning, coming to his assistance in any sudden danger. In adult life, when invoking the *jok* at a time of stress, a man calls upon the *jok* of his ancestors, regardless whether the appeal be to the spirits of his own or his mother's clan.

Men and women who are able to communicate with the spirits (*atiep* and *jok*) are called *tiet*. Their power is attributed to an ancestral spirit. When a man is ill a bullock or sheep or goats are killed as a sacrifice to the *jok*, so too when about to start on a journey or before hippopotamus hunting, while there are shrines to the *atiep* of recently dead relatives in every village.

### *Shilluk Religion*

The basis of the Shilluk religion is the cult of Nyakang their first king and ancestor of their royal house, a semi-divine hero, who with a comparatively small band of followers took possession of the present Shilluk territory and founded the Shilluk nation. Nyakang and his followers are generally considered to have come from the west, perhaps from the banks of the Bahr el-Ghazal or some of its tributaries, but other accounts state that their home lay far to the south of the present Shilluk domain.

Among the Shilluk the belief is general that the spirits of the dead are everywhere, and that they sometimes come to their descendants in dreams, and help them if they are ill, or give them good counsel, but this belief does not appear to have given rise to any cult of the dead comparable in intensity with that existing among the Dinka, its place as the working religion of the tribe being taken by the cult of Nyakang.

Something has already been said as to the position of the Shilluk king, he is in fact supreme both temporally and spiritually and for no other reason than that the spirit of Nyakang is supposed to be incarnate in each succeeding king. Concerning Nyakang there are a number of legends, some of which lay stress on his crocodilian attributes (his sister Nikaiya is still closely associated with the crocodile), nevertheless it seems certain that the Shilluk round Kodok think of him as having been human in form and in physical qualities, though unlike his more recent successors he did not die but disappeared. Before his disappearance he gave certain instructions to those of his companions who lived at Akurwa where one of his most celebrated shrines now exists. His holiness is specially shown by his relation to Juok<sup>1</sup> the High-god of the Shilluk, who made man and is responsible for the order of things. Juok is formless and invisible, and, like the air, is everywhere at once, he is far above Nyakang and men alike, nevertheless it is only through Nyakang that men can approach Juok performing the sacrifices to Nyakang that cause him to move Juok to send rain. It is uncertain to what extent Juok is worshipped directly, but his name forms part of many salutations, such as *Yimiti Juok*! 'May Juok guard you!'

The cult of Nyakang can best be approached by first considering certain shrines existing in many Shilluk villages, but which are not shrines of Nyakang.

In a small village between Kodok and Fashoda it was noted

<sup>1</sup> Juok of the Shilluk must not be confused with the *jok* of the Dinka i. e. the spirits (*atiep*) of certain old and important ancestors who take a life-long interest in their descendants whom they assist in every way, but to whom they also send sickness and death.

that two of the *tukl* of which the village was composed were more neatly thatched than the others, and that the fence surrounding them was in specially good repair. The roofs of these *tukl* terminated in an ornament which consisted of an ostrich egg from which there projected the blade of a spear. Inquiry showed that the two huts with their surrounding area enclosed by the fence were sacred, for, with the exception of one or two old people of either sex whose duty it is to keep them clean, no one entered the enclosure or even approached it without cause. The enclosure in fact constitutes a shrine, and essentially similar shrines are found in many Shilluk villages, though more commonly three or even four huts are fenced off. It will always be found that one of the huts is raised over the grave of a king, while the others are used by the folk who attend to the upkeep of the shrine. It is not difficult to compile a list of the villages in which lie the graves of the Shilluk kings, and in doing this it is found that Nyakang and his son Dag, both of whom disappeared and did not die, have many shrines, called 'graves', Nyakang possessing no less than ten, the most celebrated of which are at Akurwa, Fashoda, and Fenikang. These shrines of Nyakang do not differ in appearance from the shrines of the late Shilluk kings, and they are all spoken of as *kengo Nyakang*, 'the grave of Nyakang,' although it is perfectly well known that no one is buried there.

The *ret* of the Shilluk must be numbered among those rulers whom Sir James Frazer has called 'divine kings', and there is not the least doubt that the kings of the Shilluk were killed (until recently) with due ceremony, and with their own full consent, the underlying belief being that each incarnates a divine spirit, for whose reception a vigorous body is necessary, lest with his diminishing vigour the cattle should sicken and fail to bear their increase, the crops should rot in the fields, and men, stricken with disease, die in ever-increasing numbers. Every precaution was taken against the king's accidental death when he began to show signs of old age or ill health. It is extremely difficult to ascertain exactly what was done on these occasions.

No doubt a good deal of Shilluk folk-lore survives in the accounts commonly given of the killing of the *ret*. According to these any *niäret* (*supra*, p. 226) has the right to attempt to kill the king, and, if successful, to reign in his stead. The killing could only take place at night, for during the day the king would be surrounded by his friends and his body-guard, and no would-be successor would have the least chance of harming him. At night the king's position was very different, alone in his enclosure with his favourite wives, and no men in the royal village to protect him except a few herdsmen whose huts would be at a little distance. He was represented as passing the night in constant watchfulness, prowling round his hut fully armed, peering into the shadows, or himself standing silent and watchful in some dark corner. Then, when at last his rival appeared, the fight would take place in grim silence broken only by the clash of spear and shield, for it was said to be a point of honour for the *ret* not to call the herdsmen to his assistance.

Many commoners will give some such account as the above, and though nothing of the sort occurred during the recent period before the Mahdia, it seems that these tales reproduce with tolerable fidelity a state of affairs which once existed among the Shilluk, or among their ancestors before they occupied their present territory. One survival of the conditions outlined does indeed seem to remain, it was told on every side that the king still kept awake at night and slept only by day, and the generally sleepy condition of the king by day seemed to confirm this.

In recent times the leading part in the killing of the *ret* was assigned to the members of certain families called *ororo* who are said to be the descendants of the brothers of Oshalo, the third king of the Shilluk. It is not easy to obtain reliable information concerning the actual killing of the king during recent times, it seems that the *ororo* and some of his chiefs announce his fate to him after which he is taken to a specially built hut and strangled, the reasons determining the *ororo* to act being the ill health of the *ret* or his inability to satisfy his wives which was regarded as an undoubted sign of senescence.

There is an interregnum of some months after the death of a *ret*, the induction of the king elect being a matter of high ceremony. The king elect and a number of chiefs go to Kwom, a small village near Fashoda, where they stop until the return of two or three messengers who are sent to Akurwa near the northern limit of the Shilluk country. These men bid the Akurwa people to bring the sacred four-legged stool and the rough effigy called 'Nyakang' from the cenotaph shrine of Nyakang in their village. 'Nyakang' and the sacred stool are carried southwards towards Fashoda; each night 'Nyakang' is placed upon the stool, but by day these objects are borne upon men's shoulders, who as they march sing songs that Nyakang has commanded them to sing. After a number of ceremonies the *ret* is lifted up by the *ororo* and with 'Nyakang' carried to the shrine of Nyakang in front of which is the sacred stool upon which 'Nyakang' is placed for a time, to be succeeded by the king elect who takes his seat as the effigy is withdrawn. This appears to be the essential part of the ceremony, and may be considered to indicate the transmission of the divine spirit to the new *ret*.

As already stated there are ten 'tombs' of Nyakang (*kengo Nyakang*), the most sacred being that at Fenikang, the reason for its extreme sanctity being that Nyakang actually founded the village, the name itself being but a corruption of *fa Nyakang* 'the place of Nyakang'.

Two most important ceremonies are performed at the shrines of Nyakang:

(1) The rain-making ceremony held before the rains at the beginning of the month *alabor*.

(2) The harvest festival held when the dura is cut; i.e. about the end of the rains.

Besides these there is a ceremony which takes place shortly after the accession of a new king, and sick folk may, and often do, send animals to be sacrificed at the *kengo Nyakang*.

Finally it should be noted that dead kings including Nyakang may appear in animal forms.

*Religion of other Nilotics*

Practically nothing is known about the religion of other Nilotic tribes, but the Shir, the tribe living immediately to the south of the Dinka (to be regarded as one of the 'sub-tribes' of the Bari), have a god, Long e Ke, corresponding to the Dinka Dengdit, and a form of ancestor worship which resembles that of the Dinka. The ancestral spirits (*tilimut*) linger about the village and look after the descendants, but they also send sickness and must be placated with offerings.

*Religion of the Nuba of Southern Kordofan*

There is no definite evidence of the existence of totemism, but on Tira el-Akhdar there are people who claim descent from leopards and from snakes and will not kill them as other folk do.

Many departmental experts exist each supreme in his own department and believed to incarnate the spirit of a powerful ancestor who bestows knowledge and power beyond the scope of other men. The greatest of these experts is the rain-maker and the regulation of public life is ultimately in his hands, though he is assisted by certain subordinates who are in fact his executive officers, and who in some instances seem to partake of his spiritual authority and to aid him in the rites of his office.

The rain-maker is not allowed to go to war and every effort is made to protect his person against accident, while in some communities, as at Dilling, he may not leave the hill. When he drinks and eats with other important men, he takes the first sip or mouthful and then tells the others to fall to; this makes even a small quantity of food sufficient for all. The Jebel Eliri rain-maker keeps the large fire-sticks with which the fire is made on which oaths are sworn 'by this fire and by Kalo'.

The Nuba high gods are all more or less otiose, and religion, which is largely a cult of the dead, appears to be more developed in the northern part of Dar Nuba than in the south, but this does not appear to be due to Arab influence.

## CHAPTER VII

### GOVERNMENT AND ADMINISTRATION

Central government—Provincial government—The political service—Police and military—Justice—Revenue and expenditure—Currency, weights and measures—Education—Land tenure

#### CENTRAL GOVERNMENT

THE Agreement of January 19, 1899 between Great Britain and Egypt which arranged for the 'condominium' of the two contracting Powers in the Sudan, stipulated that their agent, the Governor-General of the Sudan, should be appointed by Khedivial Decree on the recommendation of the British Government, and that he could be removed only by such decree and with the consent of that Government. It was further agreed that the Proclamations of the Governor-General containing laws, orders, and regulations for the Sudan should be notified to the British Consul-General and to the President of the Khedive's Council of Ministers. The Governor-General would always consult the British Consul-General at Cairo on important questions of principle. Each year he makes an Annual Report which incorporates all the reports of the provincial governors and of the Departments. This is forwarded to H.B.M. High Commissioner for Egypt and the Sudan, who then dispatches it with a covering note of his own to the Foreign Office in London.

As it was anticipated that the Sudan would constitute a charge on the Egyptian Treasury, it was arranged by Regulations framed by Lord Cromer and approved by the Egyptian Council of Ministers in 1899 that the Sudan Budget should be submitted annually to the Council for its approval. An approved deficit was to be made up by a grant from the Egyptian revenues, and upon the Governor-General and his Financial Secretary devolved the responsibility of restricting expenditure to a figure which could be covered by the Sudanese revenues and the Egyptian subvention. However, other grants for special purposes sanctioned by the Egyptian Council of Ministers could also be obtained. The power of audit and right of inspecting the general financial arrange-

ments was vested in the Egyptian Ministry of Finance. Although the subvention has, since 1913, not been required, the Egyptian authorities continue to exercise such rights of supervision.

In another respect, irrigation, the Sudan is controlled by the Government at Cairo. The service is administered by the Egyptian Department of Public Works, which also advises the Governor-General on irrigation questions generally.

Apart from these measures of control the intention and practice of the Sudanese constitution is toward decentralization, and the local government possesses extensive powers, residing largely in the Governor-General.

### *The Governor-General and his Council*

By the Agreement already mentioned the supreme military and civil command in the Sudan is vested in the Governor-General. Since the time of the Agreement there have been three Governor-Generals, all of whom have been officers in the British Army and Sirdars of the Egyptian Army. The office of Governor-General is at present vested in Major-General Sir Lee Stack. All appointments to the Government Service are made by him.

Since January 1910 the Governor-General has been assisted by a Council. This consists of three *ex officio* members (the Financial Secretary, Legal Secretary, and Civil Secretary) and from two to four others nominated by the Governor-General, who hold office for three years and may be reappointed. The Governor-General is its president and is empowered to overrule its decisions. In this case his ruling becomes the formal decision of the Council, although he must record his reasons for rejecting the view of the majority, who, subject to this proviso, decide on various important matters. These are: proposed laws and regulations, the annual budget and all supplementary credits, and in general all administrative and legislative concerns submitted by the various Departments, or those which the Governor-General himself wishes to refer to Council. In other matters the Council may act as an advisory body, but from its competence all appointments and military questions are excluded.



*Officials and Departments of the Central Government*

(1) *Chief Secretaries*: Legal, Civil, Financial. The two last have an assistant secretary each. (2) *Judiciary*: Chief Justice, Advocate-General, four Judges of the High Court. (3) *Intelligence*: Director and Assistant Director, and Intelligence Officer (Khartoum). Economic and commercial questions are dealt with by a Central Economic Board which acts in an advisory capacity to the Governor-General and is presided over by the Financial Secretary. The Secretary of the Board is also Director of Commercial Intelligence. (4) *Departments*: The Departments of Administration are as follows: Legal, under the Legal Secretary with the sub-department of Lands; Finance, under the Financial Secretary with an Assistant Secretary; Civil, under the Civil Secretary with an Assistant Secretary; Customs, under a Director; Education, under a Director with an Assistant Director; Game Preservation, under a Superintendent; Medical, under a Director; Posts and Telegraphs, under a Director; Public Works, under a Director; Railways and Steamers, under a General Manager, with a Traffic Manager and Assistant Traffic Manager and Controller of Steamers; Repression of Slave Trade, under an Inspector; Stores and Prisons, under a Director; Survey, under a Director with two assistants; Veterinary, under a Director.

Under the general supervision of the Education Department are the Wellcome Tropical Research Laboratories, the Antiquities and Geological Sections, and the Sudan Government Museum.

There are a number of Divisional Irrigation Officers (for Blue Nile, White Nile, Main Nile, Tokar), responsible directly and separately to the Under-Secretary of State for Public Works, Cairo (who also advises the Governor-General on irrigation matters); they act as advisers to the governors of the provinces where they are stationed.<sup>1</sup>

The functions of the Legal Department are various. They comprise the drafting of legislative measures, the administration of civil and criminal jurisdictions, including the Mohammedan courts, of which the Grand Kadi renders an

<sup>1</sup> The office of Inspector-General of Irrigation was abolished in 1914.

annual report, land registration and settlement, and the administration of unrepresented lands. There is a special sub-department which drafts, and supervises the operation of, regulations relating to land concessions for all purposes including agricultural estates, sites in towns, and prospecting for minerals.

The Department of Agriculture manages various agricultural enterprises in the Gezira, and at Tokar, Singa, and in Khartoum, Berber, and Dongola, and assists in carrying out the assessment for land taxation. To a Sub-Department of Forests is allotted the control of the survey, reservation, protection, and exploitation of forests. It also engages in silviculture.

The Department of Education supervises the administration of the elementary vernacular schools (rate-aided *kuttabs*), primary schools, the upper school at Gordon College, the training colleges at Gordon College and Omdurman, and technical schools at Gordon College, Omdurman, and Kassala, besides geological, archaeological, and organized research of various kinds.

The Wellcome Tropical Research Laboratories are attached to the Education Department, and control sanitation and other matters of public health.

Within the province of the Game Preservation Department are the game sanctuaries and reserves, the zoological gardens, and the drafting of game-laws.

The Medical Department administers the Public Health Ordinances and works in conjunction with the Central Sanitary Board. It registers births and deaths, arranges vaccination tours, provides for quarantine, and manages the civil hospitals.

The Veterinary Department superintends the animal export trade and control of animal diseases, conducts experiments in stock-breeding, and carries out veterinary surveys.

The Repression of Slavery Department organizes patrols and coastguards and maintains posts at selected spots to assist the executive.

In addition to its ordinary postal and telegraphic service, the Posts and Telegraphs Department maintains a telephone system and a savings-bank.

The Railways Department, which manages the Sudan Government's railway system, has recently included within

its sphere the steamer service. It also operated the cotton ginning and pressing establishment at Port Sudan. With the steamer services are included the station gunboats, the Khartoum Dockyard and other river establishments, as well as harbours, lights, and Red Sea shipping.

The Customs Department maintains the services and stations for the collection of import and export duties, assesses the royalty on gum, ivory, &c., and issues trade returns.

The functions of the Departments of Finance and Public Works need not be detailed, being those that normally fall to such departments.

### PROVINCIAL GOVERNMENT

The Sudan is divided into 15 provinces and a military district. (For a list of the provinces and their districts see next section.) Each province is under a governor, who is assisted by a staff of inspectors, in charge each of one or more districts (*merkaz*) within the province.

The *governors* are exclusively British. Up to 1908 all were army officers. In 1920 of the fifteen (those of Berber, Blue Nile, Halfa, Kassala, Khartoum, Kordofan, Mongalla, Upper Nile, and White Nile) were civilians. All are appointed by the Governor-General. There is no fixed period for their term of office. They can be moved from one province to another (a practice necessitated by the climate in parts of the country). In their provinces they exercise supreme executive authority. They are representatives of the Governor-General, and responsible for the observance in their provinces of the Sudan Ordinances so far as these apply. They can issue local regulations. They wield the chief judicial authority in their provinces within the limits established by the Sudan judicial system.

The *inspectors* are always British, and are appointed by the Governor-General from the members of Sudan Civil Service. They are responsible to the provincial governor for the enforcement in their districts (about which they are continually travelling) of all orders and regulations issued for the province. They have magisterial authority and preside over local Courts of Justice.

Each province is divided into a number of districts, each of which is administered under the Inspector by an Egyptian or Sudanese mamur assisted by police officers. They have minor jurisdiction, and assist in collection of revenue, &c.

Minor administrative and clerical posts in the provinces (as also in Khartoum) are almost entirely filled by Egyptians, Syrians, and Sudanese. The increasing proportion of the latter is chiefly due to the work of the Gordon College.

### THE PROVINCES AND THEIR DISTRICTS, 1921

<i>Name of Province (Chief Town in brackets).</i>	<i>Approx. area (sq. miles).</i>	<i>Approx. population 1921.</i>	<i>Districts and Mamurias.</i>
<i>Bahr el-Ghazal (Wau)</i>	114,100	✓ 1,000,000	Central District : Wau, Tonj, Meshra el- Rek, Nyamlell. Western District : Raga, Dem-Zubeir, Kafia- kingi. Eastern District : Rumbek, Lau, Shambe, Gnopp. Meridi District : Yambio District.   S. ✓ Tembura District. Berber District : Abu-Hamed, Berber. Damer District : Damer, Zeidab. Y Shendi District : Shendi, Wad-Hamid. Atbara District : Atbara. Medani District : Medani Town. Medani District. Managil District. Rufaa District : Rufaa, Messellemia. BN Kamlin District : Kamlin, Abu-Deleig. Sennar District : Sennar. Central District : El-Fasher. Northern District : Kuttum. Southern District : Nyala. Eastern District : Um-Kadada.
<i>Berber (El-Damer)</i>	97,100	✓ 122,572	
<i>Blue Nile (Wad Medani)</i>	12,000	✓ 192,879	
<i>Darfur (El-Fasher)</i>	145,400	✓ 498,974	

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<i>Berber (El-Damer)</i>	97,100	✓ 122,572	
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	<i>Name of Province (Chief Town in brackets).</i>	<i>Approx. area (sq. miles).</i>	<i>Approx. population 1921.</i>	<i>Districts and Mamurias.</i>
N	<i>Dongola</i> (Merowe)	124,300	✓ 141,170	Northern District : Argo, Dongola, Khandak. Southern District : Debba, Korti, Merowe.
N	<i>Halfa</i> (Halfa)	112,300	✓ 38,325	Northern District : Halfa. Southern District : Mahas (Delgo), Sukkot (Abri).
K	<i>Kassala</i> (Kassala)	46,000	✓ 90,000	Northern District : Kassala, Tamrein (Hadendoa). Central District : Butana (Kashm el-Girba) Southern District : Gedaref, Mefaza, Gallabat.
12	<i>Khurtoum</i> (Khartoum)	5,000	✓ 135,070	Khartoum District. Omdurman District. Northern District : Geili, Khartoum North.
	<i>Kordofan</i> (El-Obeid)	119,000	✓ 456,642	Central District : El-Obeid. Eastern District : Um Ruaba, Rahad. Western District : Nahud, Abu-Zabad, El- Odaiya, Muglad.
	<i>Mongalla</i> (Mongalla)	63,800	✓ 207,402	Dinka-Nuer District : Duk Fayull (head- quarters), Bor, Aliab. Moru District : Amadi (head-quarters), Tombé. Yei River District : Yei (head-quarters), Loka. Rejaf District : Rejaf (head-quarters). Latuka District : Torit (head-quarters), Ikotos, Losinga, Edali. Opari District : Opari (head-quarters), Nimule, Kajo Kaji. Mongolla District : Mongalla (head-quarters).

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<i>Name of Province (Chief Town in brackets).</i>	<i>Approx. area (sq. miles).</i>	<i>Approx. population 1921.</i>	<i>Districts and Mamurias.</i>
<i>Nuba Mountains (Talodi)</i> K	34,000	✓ 268,086	Central District: Heiban, Koalib. Northern District: Dilling, Sungical. Western District: Kadugli. Eastern District: Rashad, Tagalle. Southern District: Talodi, Eliri.
<i>Red Sea (Port Sudan)</i> Kessau	27,800	✓ 34,702	Suakin District: Suakin, Sinkat (summer months). Tokar District: Tokar, Akik, Karora. Port Sudan District: Port Sudan, Mohd, Ghol
<i>Fung (Sennar) (Singa)</i> B. IV,	38,700	✓ 151,981	Singa District: Singa, Dinder (Abu Hashim), Karkoj. Roseires District: Roseires. Kurmuk District: Dar Fung (Soda), Kur- muk.
<i>Upper Nile and Pibor</i> ] U. N.		20,000	Posts:
<i>(military district)</i>			Akobo Post, Pibor Post.
<i>Upper Nile (Malakal)</i> U. V	36,000	303,470	Renk District: Renk, Melut. Shilluk District: Malakal, Kodok. Zeraf Nuer District: Tonga, Longtam. Abwong District: Abwong, Nyerol. Gaweir District: Ayod. Sobat Nuer District: Nasser. Gambeila (trading post).
<i>White Nile (El-Dueim)</i> E. N	14,700	✓ 155,000	Central District: Dueim, Kawa. Southern District: Kosti, Rabak, Tendelti, Gebelein. Geteina District: Geteina.
<b>Totals</b>	<b>990,200</b>	<b>3,796,273</b> (including Darfur but not Pibor District)	



## THE POLITICAL SERVICE

The Sudan Political Service, from the ranks of which come the inspectors, and, in cases, provincial governors and higher departmental officials, is recruited by a system of nomination of candidates. Such candidates are mainly, though not exclusively or necessarily, selected by a special Selection Board out of specially selected lists of names forwarded by Nominating Boards in the Universities of Great Britain (especially Oxford, Cambridge, Edinburgh, and Trinity College, Dublin). The names so submitted are but a comparatively small percentage of those which come under the initial scrutiny of the Boards, and with each nominee is sent a full report concerning him. The candidates have usually just taken their University degree, and are of similar standing and calibre to the candidates (under present regulations) for the Indian Civil Service. For the Sudan Service, however, (unlike this) there is no competitive written examination, and weight is attached to the candidates' physical fitness and athletic prowess, and to their personal influence among their fellows, as well as to their intellectual qualifications. 'Any defects on the score of technical knowledge are amply compensated by the governing powers, the willingness to assume responsibility, and the versatility under strange circumstances,'<sup>1</sup> which these display.

This whole system of appointment was in abeyance during the European War. The free absolutely unfettered power of selection resident from the first with the Governor-General can always change or modify the method of appointment.

In 1911 by way of experiment it became possible for a certain number of British educational officers in the country to be seconded to the administrative official ranks, to serve there for 4 years, reverting to their own service at the end of that period.

<sup>1</sup> Lord Cromer, *Modern Egypt*, ii, 548.

## POLICE AND MILITARY

There is in the Sudan a force of Civil Police, the strength of which, according to recent statistics, was 5,694. Of this number 2,250 were mounted. The police are armed with 303 Martini Enfield Rifles or carbines and bayonet, and are supplied with a complete uniform and equipment. Each province maintains and administers a detachment which is composed of locally enlisted recruits. The greatest number is stationed in the Bahr el-Ghazal, where the natives are stated to provide excellent raw material. A number of police are also employed by several Government Departments such as the Customs, Repression of Slavery, Land Settlement, and as warders in the central prisons, coast guards, and as quarantine police in the Veterinary Department.

There are three kinds of prisons in the Sudan: central, provincial, and local (*zabtia*) prisons. As a rule prisoners sentenced to terms of imprisonment up to and including two years are kept in the provincial prisons; for terms over two years they are sent to the central prisons. Prisoners in the central prisons of Khartoum North and Port Sudan are employed in various workshops, and fatigue parties are detailed for service on Government undertakings.

In normal times a detachment of the British Army of Occupation (in 1912 six companies of infantry and an independent detachment of garrison artillery with medical and supply details) is stationed at Khartoum. Besides this force the major part of the Egyptian Army is distributed among the chief towns along the extensive frontiers, and throughout the Sudan in stations whence punitive expeditions can be most speedily dispatched to disturbed localities. From the garrison at Khartoum is drawn a special field force which is held in readiness to go on punitive expeditions to any part of the Sudan.

Almost half the Egyptian Army is recruited from the Sudan. These troops are mainly blacks but also include one or two Arab units. Egyptian troops employed to garrison the

Sudan south of Khartoum are as far as possible replaced by Sudanese battalions.

At Khartoum there is a military school for Sudanese and Arab cadets.

### JUSTICE

In the agreements of January 19, 1899, and July 10, 1899, it was provided that subject to subsequent proclamation the Sudan was and was to remain under martial law. Up to the outbreak of the war in 1914 the powers so conferred were rarely exercised.

The main bodies of law in the Sudan are the Sudan Penal Code, the Code of Criminal Procedure (both promulgated in 1899), the Civil Justice Ordinance (promulgated in 1900), and the Mohammedan Law Code (*Shariya*). The three former have from time to time been revised and extended, and in some particulars modified by the Courts Ordinance of 1915.

The *Sudan Penal Code* is based on the Indian Penal Code.

The *Code of Criminal Procedure* is borrowed, so far as concerns inquiry and arrest, from the Indian Code; in regard to the hearing of a case its procedure is that of an Egyptian (or substantially of a British) Court Martial.

The *Civil Justice Ordinance* follows the adaptation of the Indian Civil Procedure Code in force in British Bechuanaland and Burmah. The procedure in civil cases is borrowed chiefly from that in force in Indian provinces which do not possess a High Court. The law is composite and not coded, and consists of: (1) customary law so far as applicable and not repugnant to 'justice, equity, and good conscience' (a phrase of stereotyped application in many parts of the East); (2) principles of English law 'to fill up the interstices'; (3) principles of Egyptian commercial law in commercial cases in which the law of civilized countries is not in agreement.

By this Ordinance, confirmed by the Mohammedan Law Courts Ordinance of 1902, questions concerning succession, inheritance, gifts, family relations, marriage, divorce, guardianship, personal status, and *waqfs* (charitable endow-

ments), are decided by the Mohammedan Courts in accordance with the *Mohammedan Code (Shariya)*, where the parties concerned are Moslems, or where they state their desire for such a decision. The secular Courts are not competent to try such suits between Moslems,<sup>1</sup> except with the consent of all parties.

*High Court of Justice.*—The High Court of Justice consists of (1) the Court of Appeal, (2) Courts of original jurisdiction. The members of the High Court are a Chief Justice and such other Judges as the Governor-General may from time to time appoint, not less than half of their number being English or Irish barristers or Scotch advocates, of at least five years' standing. The Judges previously styled 'Civil Judges' are now Judges of the High Court. Courts of Appeal are constituted by three or more members of the High Court sitting together, under the presidency of the Chief Justice or senior member present, but provision is made in certain cases for the hearing of appeals by less than three members. The Legal Secretary may exercise any of the functions of a Judge of the High Court and if he think proper may sit as a member of the Court of Appeal, in which case he presides.

Judicially the Sudan is independent and beyond the High Court of Appeal there is no appeal.

### *Civil Justice*

*The Courts.*—The Courts Ordinance 1915, amended 1920, constituted the Sudan Civil Law Courts as follows, certain sections of the Civil Justice Ordinance being repealed.

The original jurisdiction of the High Court is exercised by its Judges sitting singly, with jurisdiction to hear and determine all civil suits.

*Province and District Courts.*—Subordinate to the High Court of Justice a Province Court was set up in each Province, the Judges of which consist of a Province Judge (except in Khartoum Province and others where a branch of the High Court exists), and of District Judges, who may be of three

<sup>1</sup> But they have jurisdiction between Non-Moslems.

grades (see below). Province and District Judges may be appointed *ad hoc* by the Governor-General ; in Provinces where no Province Judge or acting Province Judge is appointed (with the same exception as above), the Governor or acting Governor acts as such. Inspectors and Mamurs are *ex officio* members of the Province Court, Senior and First Inspectors having the powers of District Judges of the first grade, other Inspectors those of the second grade, and Mamurs those of the third grade. Subject to orders from the Governor-General, their jurisdiction in civil suits is limited as follows :

First grade : original suits without limit as regards value.

Second grade : original suits not exceeding £E.100 in value.

Third grade : original suits not exceeding £E.5, within certain limitations (e. g. not against the government or concerning titles to land .

But in a district to which a special District Judge has been appointed by the Governor-General no Inspector or Mamur may exercise such judicial powers unless so directed by the Legal Secretary. Inspectors of second grade may be specially nominated District Judges of first grade.

The High Court or the Province Court may decide itself to try a suit pending in a subordinate Court or may transfer a suit pending before itself to a subordinate Court.

*Appeals.*—A decree or order by a District Judge of the first grade in an original suit of value not exceeding £E.50 is final, as is a decree or order by a District Judge of the second grade on an original suit of value not exceeding £E.30, unless the District Judge, or Judge to whom the appeal would otherwise lie, grant leave of appeal. In all other cases appeal is allowed to a Judge of the High Court in Provinces where a branch of that Court exists, in others, to the Province Judge. The latter may transfer appeals to a Judge of the High Court, or to a District Judge of the first grade. A decree or order, whether original or appellate, made in a suit of value not exceeding £E.100 by a Judge of the High Court or Province Judge is final unless such Judge or the Court of Appeal

grant leave to appeal ; from every other such decree or order an appeal lies to the Court of Appeal. When a decree has to be executed in another Province from that in which it was passed, it is, as a rule, referred for execution to the Province Judge, or Judge of the High Court, if any, in the Province where it is to be executed.

At present there are branches of the High Court at Khartoum and in the Red Sea Province. Specially appointed District Judges of the first grade who are British barristers are now stationed in the Provinces of Halfa, Berber, Blue Nile White Nile, and Kordofan, and Egyptian or Syrian District Judges of the second grade specially appointed are stationed in Khartoum, Khartoum North and Omdurman permanently, and temporarily in the Red Sea and White Nile Provinces.

### *Criminal Justice*

Every Judge of the High Court and every Province Judge is a Magistrate of the First Class under the Code of Criminal Procedure, and has in addition the powers of a Governor under that Code in all criminal matters referred to him. Such Judges are not subordinate to the Mudir, who may from time to time hand over to them the functions prescribed for him in the above Code. If the Governor-General refers any criminal case to the Court of Appeal that Court has all the powers of a Mudir's Court and full powers of finally determining the finding and sentence if any.

The jurisdiction of Magistrates in criminal suits is limited as follows :

First Class : sitting as a non-summary Court, imprisonment up to one year, fines up to £E.20 ; as a summary Court, imprisonment up to 2 calendar months, fine to £E.5.

Second Class : sitting as a non-summary Court, imprisonment up to six calendar months, fine up to £E.10 ; as a summary Court, imprisonment up to 15 days, fine up to £E.2.

Third Class : as a summary Court only, imprisonment up to seven days, fine up to P.T.20.

The criminal Courts are as follows :

1. *The Mudir's Court*, composed of the Governor or his representative (viz., a magistrate of the first class or one of the Judges of the High Court) and two other magistrates nominated by him. This court has general competence and may pass any sentence authorized by law. Provincial Governors may form such a court for the trial of any crimes, however serious, in the locality where the crime was committed. It is regarded of importance that offences should be tried locally. All sentences of these courts are submitted to the Governor-General for confirmation.

2. *Minor District Courts*, composed of three magistrates, presided over by a magistrate of the first or second class other than the Governor. They may pass any sentence of imprisonment for a term not exceeding 7 years, or of fine not exceeding £E.50. Sentences of these courts are submitted for confirmation to the Governor.

3. *Courts of magistrates* of the first, second, or third class, the sentences of which are open to appeal to the Governor.

In 1908 a special Police Magistrate for Khartoum was instituted, who is responsible under the Governor for the administration of criminal justice in that town.

#### *Mohammedan Law Courts*

Under the old Egyptian Government, every place of any importance in the Sudan had its *Kadi* (judge) to administer Mohammedan law. He received little or no salary, but reaped what harvest he could from fees or bribes. After the reconquest, Mohammedan Courts, presided over by *Kadis*, who now receive a fixed salary, were set up by the Ordinance of 1902 already quoted. All local *Kadis* are under the supervision of the Grand *Kadi* at Khartoum, who submits an annual report to the Legal Secretary ; on the administrative side they are under the direct control of the latter, and judicially, they are independent of the provincial executive.

These Courts now consist of the following :

1. *High Court*.—This is composed of the Grand *Kadi*, the

*Mufti*, and the two Inspectors of Mohammedan Courts. It has the powers of revision and appeal as regards the lower Courts.

2. *Mudiria and Courts.*

3. *District Courts.*—The number and popularity of these are steadily increasing. This will be more and more the case as more students educated by the Gordon College are available for the post of Kadi; the first six were appointed in 1906. The number of cases heard in these Courts rose from 6,891 in 1908 to 10,272 in 1914; the fees received rose from £E.2,323 in 1904 to £E.4,357 in 1913. Questions of conflict of jurisdiction between them and the secular Civil Courts are referred to a Council consisting of the Legal Secretary, the Grand Kadi, and the Chief Justice, or their respective deputies.

*Land Registry*

Attached to the Legal Department is the Land Registry under a Registrar General who is a Judge of the High Court with one British assistant who is a District Judge of the first grade. The lands at present surveyed and registered include the whole of the cultivated lands of Halfa, Dongola, Berber, Khartoum, most of those of the Blue Nile, and the White Nile part of Sennar and certain town lands such as those of Suakin, Port Sudan and El-Obeid.

All transactions in registered lands must be registered and the system will in time be extended to the whole Sudan.

*Tribal Law and Custom*

Tribal law and custom are administered by sheikhs and chiefs recognized by Government. Their decisions are liable to review by a British magistrate, and no sentence of capital punishment may be passed by them. There is always right of appeal to a government official from a decision given under tribal or communal law, and all inter-tribal or inter-communal disputes are submitted to such. But in the southern provinces especially tribal law and custom and procedure (with the above safeguards) must for long years play an important part, and the rigorous and universal application of the two



Sudan Codes be delayed. Tribal customs concerning betrothal, marriage, divorce, cattle-lifting, &c., differ so widely that the Government cannot apply universal rules and refrains from interference with chiefs' decisions so far as generally accepted principles of morality and justice permit

#### REVENUE AND EXPENDITURE

In the year 1913 the Egyptian Government ceased to make any subvention to the Sudan in aid of its civil expenditure, and the Sudan Government has since had to rely on its unaided resources.

The amount of this subvention, which started at £E.156,000 in 1899 and rose to £E.268,000 in 1902, had gradually been reduced until it stood at £E.163,000 in 1912. In 1913 a new settlement of the financial relations between Egypt and the Sudan was arrived at. It was decided, on the one hand, to discontinue the contribution paid by the Egyptian Government to the Sudan, and on the other to credit the Sudan with the Customs dues collected in Egypt on goods coming to and going from the Sudan which had previously been collected and retained by Egypt.

The effect of this settlement was that the contribution by Egypt for civil and military expenditure which in 1912 stood at £E.335,000, of which £E.163,000 was on account of civil expenditure and £E.172,000 on account of the army, disappeared from the Revenue side of the Budget, while the Customs receipts were increased by £E.85,000, this being the figure then estimated as the equivalent of the duties collected in Egypt. At the same time the sum of £E.172,000 paid to the Egyptian Government for the maintenance of the army in the Sudan was removed from the expenditure side of the Budget, since it was recognized that the method of accounting, by which the sum of £E.172,000 appeared on both sides of the Budget, in order to bring out the fact that a part of the Egyptian military expenditure was properly chargeable to the Sudan, was complicated and liable to misapprehension.

The suspension of the Egyptian contribution could not have taken place at a more inopportune time. 1913 was the second year in succession in which the Sudan had suffered from low floods and poor rain. Business suffered from the general depression and from the feeling of unrest brought about by the war in the Balkans, and the value of exports fell from £E.1,373,000 in 1912 to £E.1,185,000 in 1913. The year 1914 was worse. In fact from the point of view of revenue and of the economic situation, it was perhaps the most difficult year in the history of the Sudan. The Nile flood of the previous year had been one of the worst on record, and the rains, which had completely failed in several districts, were scanty in almost all the provinces. In August of that year the war broke out and trade, already suffering from the prolonged agricultural depression, received a further set back. The year 1915 was generally not much better though the country was now well stocked with food and agricultural produce. Owing to war conditions and the scarcity of shipping there was little demand for produce for export at first and the population was short of ready money. The settlement of arrears consequent on the previous bad years, and the payment of current taxes, constituted a heavy strain upon their resources.

Nevertheless in spite of these adverse conditions and the cessation of the payment of any subvention by Egypt, it was possible, through the adoption of stringent measures for the reduction of expenditure, to close the accounts without a deficit, and in fact with small surpluses as shown in the following table :

<i>Year.</i>	<i>Revenue.</i>	<i>Expenditure.</i>	<i>Surplus.</i>
	£E.	£E.	£E.
1913 . .	1,568,352	1,533,065	35,287
1914 . .	1,543,549	1,531,346	12,203
1915 . .	1,495,227	1,463,934	31,293

The expenditure of the Government, which had been growing steadily (from £E 230,000 in 1899 to £E.1,533,000 in 1913), had to be curtailed in 1914 and 1915 to a greater extent than

appears from the above figures, owing to the great rise in the price of labour, coal and all necessary materials.

In 1916 a period of comparative prosperity set in, since the war was now giving a great impetus to the export trade of the country. The favourable factors continued to operate in 1917 and 1918, and, although the rains in 1918 were indifferent and the Nile low, the economic condition of the country did not suffer any real set back in 1919.

The following table shows how this revival in the prosperity of the country has affected the various heads of revenue :

<i>Classification.</i>	<i>Receipts.</i>						
	1913.	1914.	1915.	1916.	1917.	1918.	1919.
	£E.	£E.	£E.	£E.	£E.	£E.	£E.
<b>1. Provinces.</b>							
Land Tax—							
(a) Taxed land	45,078	30,447	29,219	46,564	59,000	63,247	42,650
(b) Ushur (Tithe)	122,430	104,922	123,321	99,930	131,087	183,362	170,100
Date tax	16,380	17,692	12,361	22,718	25,706	22,703	21,300
Animal tax	81,599	92,335	79,108	105,774	116,619	141,848	148,950
Tribute from nomad tribes	30,059	24,147	22,918	36,918	39,167	42,667	36,100
Trader's tax	7,906	7,622	6,258	8,086	10,292	26,911	36,250
Royalties	89,897	70,733	68,252	82,093	104,126	144,442	128,300
Timber and fire-wood	31,273	30,295	24,686	17,314	19,464	66,973	79,100
Rent from Government lands and properties	31,701	20,918	33,077	22,843	61,540	41,259	32,000
Miscellaneous	54,805	60,923	56,821	57,616	64,850	80,630	76,000
<b>Total</b>	<b>511,128</b>	<b>460,034</b>	<b>456,021</b>	<b>499,856</b>	<b>631,851</b>	<b>814,042</b>	<b>770,750</b>
<b>2. Departments and Services.</b>							
Customs	186,837	189,864	174,932	233,243	220,236	249,095	328,000
Posts and Telegraphs	63,607	69,276	65,915	91,641	91,952	117,978	118,400
Railways and Steamers	701,389	726,555	689,518	902,479	1,078,275	1,256,516	1,278,000
Agriculture and Forests	723	397	1,149	19,858	30,330	4,245	7,100
Legal	10,555	9,431	9,379	8,746	12,636	12,738	14,180
Veterinary	9,255	10,217	13,454	13,452	18,585	35,377	25,600
General Central Services	39,685	29,508	42,633	44,336	59,869	224,963	341,500
Other Departments and Services	45,173	48,267	42,226	44,245	51,621	59,735	66,970
<b>Total</b>	<b>1,057,224</b>	<b>1,083,515</b>	<b>1,039,206</b>	<b>1,358,000</b>	<b>1,563,504</b>	<b>1,960,647</b>	<b>2,179,750</b>
<b>Grand total</b>	<b>1,568,352</b>	<b>1,543,549</b>	<b>1,495,227</b>	<b>1,857,856</b>	<b>2,195,355</b>	<b>2,774,689</b>	<b>2,950,500</b>

It should be explained, however, that the increase in revenue is also due to various measures that have been adopted since 1916 to meet the increased cost of administration.

The expenditure on the railways, which is the largest revenue-earning department, rose in 1916 from £E.382,300 to £E.522,200, the cost of coal alone being £E.182,600 as against £E.74,800 in 1915. The price of Welsh coal reached in that year £5 10s. c.i.f. Port Sudan as against a pre-war price of £1 7s. In order to provide for a portion of the increased expenditure of the Government in that year a surtax of 10 per cent. on all goods rates was introduced, and the freight rates for animals on the Shellal-Halfa Reach and the railways between El-Obeid and Khartoum were increased. The import duties on tobacco, tombac and alcohol were raised, as also the royalites on gum and senna Mecca. The additional revenue derived from all these measures amounted to about £E.70,000, the remainder of the increased revenue in 1916 being due to the general expansion of trade.

The steady rise in the cost of materials, stores and living since 1916 entailed increased provision for expenditure on all services, issue of war gratuities and improved rates of pay. In time a permanent improvement in pay was found to be inevitable and an increase of 20 per cent. on all salaries was sanctioned as from October 1, 1919. The expenditure incurred on war gratuities amounted to £E.21,000 in 1917, £E.444,000 in 1918, and £E.316,000 in 1919. In 1920 the expenditure under this head was estimated at £E.470,000 and the increase of 20 per cent. at £E.220,000.

In order to meet the heavy increase in expenditure additional revenue had to be raised, the measures adopted in 1916 having become totally inadequate. The animal tax, raised in 1916, was again increased in 1919, as was also the trader's tax. The increased rates were fully justified by the expansion of trade, the high prices of camels, cattle and sheep and the large profits made by the trading community. The trader's

tax was introduced in 1913 and remained at the original admittedly low rate until 1919. Even now the rates are very moderate, being 4 per cent. on profits below £E.100 per annum, 5 per cent. on profits exceeding that but below £E.500, and 6 per cent. on profits above £E.500.

Nothing further could be done in the domain of direct taxation. The Ushur and land tax are the other most important direct taxes. The yield from land tax is comparatively small, and where the tax is levied it is recognized to be sufficiently high. Usage and tradition have established the Ushur tax at 10 per cent., and for political as well as financial reasons it was not considered advisable to introduce any change in these taxes.

In the domain of indirect taxation the field was wider. The excise duty on sugar introduced by Egypt in 1917 was levied on sugar exported to the Sudan, the Sudan Government being credited with the duty. The amount thus derived was about £E.180,000 and was a great relief to the Sudan treasury. In addition to this, as the need for further funds was pressing, the Sudan Government constituted itself in 1919 the sole importer of sugar. This measure enabled the Government by a system of licences to control the price of this commodity and to prevent profiteering. On the whole this arrangement worked satisfactorily and enabled the Government to make a further profit of about £E.70,000 in 1919. The permanent increase on salaries, however, and the raising of the war gratuity to 40 per cent., involved an additional expenditure of about £E.500,000 per annum; this created a very difficult situation and threatened to result in grave embarrassment to the treasury. The difficulties of the situation were further increased by the abolition of the excise duty on sugar by Egypt, which involved a loss of £E.180,000 to the Sudan Government. By adding to the sale price of sugar P.T. 2½ per kilog. the treasury was able to recoup this loss and realize some £E.157,500 in addition.

In the way of indirect taxation there was further increase in railway and steamer rates. The surtax on goods and

animals was gradually raised with the rise in the cost of material, especially coal. On January 1, 1917, it was raised to 20 per cent., on October 1 to 30 per cent., and in September 1918 to 40 per cent. On January 15, 1920, it was raised with certain reservations in favour of essential food stuffs to 100 per cent. The surtax on passenger fares was likewise raised from 50 per cent. to 100, per cent. from the same date. The amount anticipated from this last increase was estimated at £E.300,000.

The increase in the tobacco duty resulted in immediate and direct addition to the revenue. The increased revenue anticipated to be derived from these rises was estimated at about £E.40,000 in 1920.

The Sudan Budget in 1920 benefited also by the profits accruing from the note issue of the National Bank of Egypt and credit was taken for the sum of £E.35,000 on this account in the Budget for 1920. The Sudan Government thus managed to find funds for all the increased expenditure thrown on the treasury in spite of the suspension of the contribution by Egypt. The annual Budgets were balanced without imposing hardships on the population or impairing the prosperity of the country, and since 1916 the final accounts have been closed with substantial surpluses. These surpluses have been passed to the Reserve Fund and utilized to meet some of the many and urgent demands for capital expenditure. But it must not be overlooked that a very large proportion of the additions thus made to the revenue are of a transitory nature and the annual Budgets during the whole period are on a war basis.

The Government has, therefore, considered it wise to strengthen its financial position by increasing the unpledged balance of the Reserve Fund to the maximum amount possible, and by setting aside, out of the surpluses realized, the largest possible amount towards the working cash balance required by the treasury. The unpledged balance of the Reserve Fund has accordingly been raised to £E.119,500, and a sum of £E.100,000 has been set aside with a view to building up

a working cash balance of at least £E.450,000 as soon as the situation permits.

With a view to increasing production the Government have continued the allotment of funds for the completion of the scheme, embarked upon in 1909 for the irrigation of some 100,000 feddans in Dongola Province by annual flooding on the basin system. The amounts allotted since 1913 amount to £E.27,000.

In 1917 the urgent need to increase supplies of food in Egypt and the Sudan led to an understanding by which it was decided to combine the resources of both countries. In the Sudan a number of areas in Berber and Dongola Provinces, amounting to about 19,000 feddans, were prepared and put under cultivation by means of pump irrigation. The money for this scheme, estimated at £E.400,000, was advanced by Egypt on certain conditions as to repayment. Of the various projects which have been studied for increasing production and developing the resources of the country the most important are: (1) The irrigation of the Gezira Plain; (2) the irrigation of the Tokar cotton producing area; (3) the extension of the Sudan railway system. With a view to carrying out the above works the Sudan Government have raised a loan of £E.6,000,000. The history of this loan is given under the section on Irrigation Projects and Improvements (v. pp. 370-1).

In 1916 the Egyptian Government found itself unable to supply the Sudan with its requirements of silver. The Sudan Government, therefore, with a view to meeting the increasing demand of trade and averting a critical situation authorized the free circulation of British silver florins and shillings. Since 1916 a sum of £E.800,000 in florins and shillings has been imported. In fiscal and currency matters the action of the Sudan Government is necessarily governed by the action of Egypt. Consequently the currency measures taken by the Egyptian Government at the outbreak of the war by conferring inconvertibility on the notes of the National Bank

of Egypt and by making them legal tender were adopted in the Sudan with success, and the currency notes of P.T. 10 and 5 issued by the Egyptian treasury were introduced into the Sudan.

In 1919 the public finances continued to improve, and the revenue reached a figure never before attained.

The accounts for the year as nearly as can be at present estimated are as follows :

	<i>Budget Estimates 1919.</i>	<i>Anticipated Amounts.</i>
	£E.	£E.
Revenue . . . .	2,685,000	2,950,500
Expenditure . . . .	2,685,000	2,683,000
Surplus . . . .		267,500

This result is eminently satisfactory, but the sum of £E.267,500 cannot be looked upon as a real surplus. The Sudan Budget only provides for services of a recurring nature, demands for capital and extraordinary expenditure being met out of such funds as may be available in the Reserve Fund. The amount of the surplus will therefore be passed to this fund to meet some of the many and urgent demands that have to be financed in this manner.

The figures for 1919 are given on p. 296.

The following statement showing the ordinary revenue and expenditure of the Government since 1916 is of interest (for 1913-15 see p. 295) :

<i>Year.</i>	<i>Receipts.</i>	<i>Expenditure.</i>	<i>Budget Surplus.</i>
	£E.	£E.	£E.
1916 . . . .	1,857,856	1,745,532	112,324
1917 . . . .	2,195,355	1,901,941	293,414
1918 . . . .	2,774,689	2,336,315	438,374
1919 . . . .	2,950,500	2,683,000	267,500



*Reserve Fund*

The unallotted balance of the Reserve Fund on December 31, 1918, stood at £E.585,005. The credits sanctioned against the Reserve Fund in 1919 amounted to £E.465,500, and were opened for the following services :

	£E.
Rolling-stock and renewals (railways and steamers) . . . . .	145,000
Working cash balance . . . . .	100,000
Public works . . . . .	49,500
Electricity, water and ice supply plant, Khartoum . . . . .	29,600
Reserve stores . . . . .	30,000
Pearl fishery service . . . . .	7,000
Flood protection works . . . . .	4,500
Amortization of overdraft . . . . .	20,000
Protection works, Gambella . . . . .	5,000
Erection of oil tank, Port Sudan . . . . .	5,000
Water supply scheme . . . . .	10,000
Re-arming Sudan Government Police . . . . .	10,000
Various other services . . . . .	49,900
Total . . . . .	465,500

The balance remaining unpledged was £E.119,500. During the year the balance was increased by the proceeds of sales of Government land and other receipts, and on December 31, 1919, it was approximately £E.158,500. To this would have to be added the sum of £E.267,500, representing the estimated surplus of 1919, making the total sum available in the Reserve Fund on January 1, 1920, £E.426,000.

The allotment of this sum was under consideration, but owing to the fact that the Budget surplus is not the result of normal expansion of the revenue, but is mainly due to sources which are temporary, such as the receipts derived from the control and sale of sugar by Government and to the abnormal economic conditions prevailing, it is a matter of paramount importance that a considerable sum should be left unallotted to meet emergencies.

*Budget for 1920*

The following table gives a summary comparison of the Budget of 1919 and 1920 :

	1920. £E.	1919. £E.
Estimated expenditure .	3,500,000	2,685,000
Estimated receipts .	3,500,000	2,685,000

The increase in the estimates of expenditure is made up as follows :

New appointments (including appointments suspended in 1919 and restored in 1920) .	£E. 44,927
Promotions and increases of pay affecting the Budget .	33,932
Allowances and services .	209,235
	288,094
General increase of pay and war gratuity .	526,906
Total .	815,000

## CURRENCY, WEIGHTS AND MEASURES

After the reconquest of the Sudan one of the first acts of the new Government was to introduce the Egyptian monetary system and the coinage then current in Egypt which included British, Latin and Turkish gold, supplemented a few years later by the notes of the National Bank of Egypt. This currency was not at first made legal tender by ordinance but attained to practically the same status by being treated as legal tender by Government treasuries and the branches of the banks.

During the war important changes were introduced. A proclamation of August 4, 1914, declared the notes of the National Bank of Egypt to be legal tender and temporarily inconvertible. Early in 1916 owing to the difficulty of minting Egyptian silver fast enough to meet the abnormal demands largely due to British Army purchases, King George V shillings and florins of both English and Australian issues were authorized to circulate at the rate of P.T. 5 per shilling. Subsequently the whole currency situation was

regulated by the promulgation of the Coinage Ordinance 1918 and various notices issued thereunder, supplemented by the Egyptian Government Currency Note Proclamation 1919 and the Coinage Ordinance 1920.

Under this legislation the currency of the country is now as follows :

*Legal tender Egyptian Coinage of 1916 issues*

	<i>Milliemes.</i>
Gold . . . . .	1,000
" . . . . .	500
Silver . . . . .	200
" . . . . .	100
" . . . . .	50
" . . . . .	20
Nickel . . . . .	10
" . . . . .	5
" . . . . .	2
" . . . . .	1
Bronze . . . . .	$\frac{1}{2}$

*Legal tender Egyptian Coinage of old issues minted prior to 1916 and bearing the name of the Sultan of Turkey*

Gold . . . . .	1,000
" . . . . .	500
" . . . . .	250
" . . . . .	100
" . . . . .	50
Silver . . . . .	200
" . . . . .	100
" . . . . .	50
" . . . . .	20
" . . . . .	10
Nickel . . . . .	10
" . . . . .	5
" . . . . .	2
" . . . . .	1
Bronze . . . . .	$\frac{1}{2}$
" . . . . .	$\frac{1}{4}$

*British Coinage*

	<i>Milliemes.</i>
The sovereign is legal tender at . . . . .	975
The following British silver of King George V English and Australian issues is permitted to circulate freely :	
Florin . . . . .	100
Shilling . . . . .	50

*Coinage permitted to circulate and accepted at Government Treasuries  
but not reissued**Gold.*

Coins of Latin Union equivalent to 20 franc piece . . . . .	771½
Gold multiples and sub-divisions of above are accepted at rates in proportion to 20 franc piece.	
Turkish pound . . . . .	887½
Gold multiples and sub-divisions of above are accepted at rates in proportion to Turkish pound.	

*Legal Tender Paper Money*

	£E.	Milliemes.
	100	
	50	
	10	
National Bank of Egypt notes . . . . .	5	
	1	
		500
		250
Egyptian Government currency notes . . . . .		100
		50

The Sudan does not profit from the currency note issue nor yet from the seigniorage on the token coinage, but is not charged with the cost of minting. On the other hand the Sudan Government shares in the profit derived from notes of the National Bank of Egypt.

No coinage other than the above is permitted to circulate in the Sudan, but in order to facilitate local trade with neighbouring countries certain exchange arrangements have been instituted on the frontiers. The most important of these has to do with the Maria Theresa dollar, which was a popular coin in the Sudan during the ascendancy of the Mahdi and resisted all his attempts to supplant it. It is still the principal currency in Abyssinia and the only effective medium of exchange for trade between the Sudan and Abyssinia, also between the Sudan and Eritrea. It is variously known in the Sudan as the Rial Gushali, Rial Abu Tera or Rial Abu Nucta. It is accepted at Sudan Government Treasuries on the Abyssinian and Eritrean Frontiers in payment of customs dues, C.O.D. parcels, &c., and is issued when available at

a slightly higher price. The rate for issue and acceptance by Sudan Government Treasuries is ordinarily made to vary according to the intrinsic value of the coin calculated at the current market price of silver, the issue rate being usually a piastre higher than the acceptance rate, thus the rate at the beginning of February 1921 was P.T.  $13\frac{1}{2}$  per dollar for issue and P.T.  $12\frac{1}{2}$  for acceptance. The local market value of the coin which is frequently unobtainable has fluctuated between P.T. 7 and over P.T. 20 during the years 1913-20.

On the Southern Frontier, where no banks exist, trade with Uganda is facilitated by an agreement whereby the currencies of the two countries are exchanged at certain Government treasuries on either side of the frontier at fixed rates. The present rate of exchange is  $97\frac{1}{2}$  milliemes per rupee and a small commission is charged. A similar agreement exists with the French Government of Wadai whereby French and Sudan currencies are exchanged at certain treasuries on either side of the Darfur frontier. The present rates inclusive of commission are  $18\frac{1}{2}$  piastres for every five franc piece or its equivalent issued and 18 piastres for every five franc piece or its equivalent received. In some of the less developed negro districts trade goods and beads are still the medium of exchange, the articles most in demand varying according to fashion.

The following is a table of weights and measures with British and metric equivalents.

**Length :**

*Diraa* (or *pik*) *baladi* = 22.83 in. = .58 metre (for ordinary measure). A Sudan *diraa* = length from elbow to middle finger tip of left arm plus breadth of right hand = about 57 centimetres =  $22\frac{1}{2}$  in.

*Hindaia* (cloth) = 65.82 centimetres = 25.88 in.

*Hindassa* and *pik Stambuli* practically 2 ft. 2 in. = .66 metre.

*Kadam* = 1 foot ; *busa* = 1 inch (little used).

*Kassaba* = 11 ft. 7·76 in. = 355 metres.

*Pik mehmari* = 29·53 in. = ·75 metre (architecture, &c.).

*Saâ* (hour) = anything between  $2\frac{1}{2}$  and 4 miles.

*Habl*, a linear measurement used on Sudan river land, usually = 8 *diraa*, but may be anything from 2 to 10 *diraa*.

The land measurer's chain is 20 metres in length and has 100 links.

Height or depth :

*Ragil* = (approximately) 5 ft. 6 in. is the distance from finger tips to finger tips with the arms held out horizontally. This is invariably used for measuring wells.

Square Measure :

*Feddan* = 333·3 square *kassabas* = 24 *kirats kamel* = 72 *hab-bahs* = 144 *daneks* = 576 *sahms* = 13·824 *sohts* = 1·038 acres = 4,200 sq. metres = 70·88 yds. sq. = 5,024 sq. yds.

*Kirat* = 209·35 sq. yds. = 175 sq. metres.

*Sahm* = 8·72 sq. yds. = 7·3 sq. metres.

Square *kassaba* = 15·07 sq. yds. = 12·60 sq. metres.

Square *pik mehmari* = 6·43 sq. ft. = ·562 sq. metres.

*Gadaa* for measuring Sudanese rainland = about  $5\frac{1}{3}$  *feddan* ; sides = 64 *ûd* of 4 *diraa* each.

Weight :

*Dirhem* = 16 *kirats* = 48·15 gr. (Troy) = 1·76 drs. = ·11 oz. = 3·12 grammes.

9 *dirhems* = 1 oz. practically.

*Girba* (rough liquid measure) = 14·67 galls. = ·66 cubic metres = 40 cm. cubed.

*Haml* or *heml* (camel load) = 200 *okes* = 550·27 lb. (Egypt) = 250 kilogrammes (300 lb. for Western or Bedouin camels).

*Hemla* = 66 *okes* = 165·08 lb. = 75 kilogrammes.

*Kantar* = 8 *tumna* = 100 *rotls* = 36 *okes* = 99·05 lb. = 44·93 kilogrammes.

*Kantar* (Alexandria) = 112 *okes* = 308·15 lb. = 140 kilog.

*Midd* (Berber) =  $2\frac{2}{3}$  *tumna* (of 3 *tasa*) = 8 *tasa* (of  $1\frac{1}{3}$  *rotls*) =  $10\frac{2}{3}$  *rotls*.

*Mithkal* (for precious metals and stones) =  $1\frac{1}{2}$  *dirhems* = 24 *kirats* = 72·22 gr. = 4·68 grammes.

*Oke (ugga)* = 400 *dirhems* = 2·77 *rotls* = 2·19 pints = 2·75 lb. = 1·25 kilogrammes.

*Rotl* = 12 *ukla* = 144 *di hems* = ·99 lb. = 450 grammes = ·79 pint.

*Rotl* (Abyssinian) = 10 *mokha* = 120 *dirhems* = ·68 lb.

*Ruba* (of dates) = about 10 lb. 30 *rubas* = 1 camel load.

*Tonolata* (French tonne) = 800 *okes* = 2,204·62 lb. = 1,000 kilogrammes = 10 quintaux.

*Tonolata Inglisi* (ton) = 814 *okes* = 1,016·06 kilogrammes =  $7\frac{1}{2}$  *ardebs* (of wheat).

*Ukla* = 12 *dirhems* = 1·032 oz. = ·066 pint = 37·44 grammes.

*Ardeb*. At Khartoum 1 *ardeb* = 12 *kela* = 24 *rub* (of 4 *melwa*) = 96 *melwa* (of  $3\frac{1}{8}$  *rotls*) = 300 *rotls* of dura. This is the standard *ardeb*. Others of different volume are in use.

In the native market cotton is quoted per *kantar*, unginned of 100 or 105 *rotls*; when ginned or pressed, by the ordinary *kantar* of 99 *rotls*. At Tokar a *kantar* of cotton = 100 *rotls*.

The average measurement of 50 *kantars* of wood varies according to locality.

South of Khartoum 8 ft. 6 in. × 4 ft. 6 in. × 4 ft. 6 in. = 50 *kantars*, or roughly 1 cubic metre = 10 *kantars*. (If wood is thin and dry 1 cubic metre =  $9\frac{1}{4}$  *kantars* north of Khartoum.)

1 cubic metre =  $9\frac{1}{4}$  *kantars*.

## EDUCATION

### *Private Schools*

Islam has always encouraged such a simple educational system as consists in children learning passages from the Koran by heart. Such 'private schools' for the purpose have always since the Mohammedans came into the country existed in the towns and villages of the Sudan, and continue to exist. They are not satisfactory. Housed usually in dark, over-crowded, filthy, and insanitary hovels, such schools

benefit few beyond the local *fikīs* or priest teachers, themselves uneducated and ignorant. Only unintelligent repetition by rote is taught to young children, whom their parents claim as early as possible for labour in the fields. Yet the very existence of these schools revealed to some small extent the existence among the inhabitants of the northern Sudan of some interest in education, and of this the new Government was quick to take advantage. That the government elementary schools will presently be so numerous as to supersede altogether the native private school is greatly to be desired.

Under the category of private schools come the Christian Mission schools established with the sanction of the Government at Khartoum and a few other towns, but not allowed generally among Moslems. The greatest care is taken that no Moslem parent shall send his child to such a school (which is entirely voluntary on his part) without understanding clearly beforehand the nature of the instruction there given.

### *The Government System*

In education the new Government saw the best 'constructive' method of combating the latent religious fanaticism of the Arab population, a fanaticism bred by ignorance as well as by discontent. On education also of the boys of the country it realized that there depended the whole recruitment in the future of the junior administrative and clerical staffs in Khartoum and in the provinces. On the increase and diffusion of technical and agricultural knowledge among the inhabitants themselves any real advance in the welfare of the country similarly depended. In 1900 the foundations of a comprehensive scheme of government education were for these three reasons firmly laid. There is no compulsory education in the Sudan, but from the government village school at one end of the scale to the many activities of the



Gordon College at Khartoum (opened November 8, 1902) at the other end, the education of the children of the country receives unremitting attention. In 1914 the first Director of Education, Mr. James Currie, on retiring, looking back on his 14 years' work, declared that the main results of the government system had thus far been three in number. A professional class had been created among the Sudanese themselves, capable of taking at least a limited share in the administration ; by the institution of a system of local rating the foundation had been laid of a widespread system of vernacular and technical instruction ; and organized scientific work was being steadily pursued at, or under direction by, the Gordon College. All that the Sudan needs in this connexion is no change in, but rather a wide, if perforce slow, extension of the system. It has yet to be applied, cautiously and in some quite simple form, to the negroid population of the southern Sudan, and, throughout the country, girls' education has scarcely made a start.

The schools directly under the central authority of the Education Department fall into five classes :

1. Elementary Vernacular Schools.
2. Primary Schools.
3. Upper School.
4. Training College.
5. Instructional Workshops.

*Elementary Vernacular Schools or Kuttabs.*—These form the basis of the educational system and are considered to be politically the most important part of the work of the department. These kuttabs are as a rule supported by the funds raised by the local education rate which is levied at varying rates throughout the country on land, crops, animals, or date trees as may be arranged between the governors of provinces and the central government. The age of admission is seven to twelve years. Sons of ratepayers are not required to pay fees ; other boys pay P.T. 10 per month. The chief

secular subjects are elementary Arabic, arithmetic and geography. It is not intended that these elementary schools should be avenues of entrance to government, but means of spreading enlightenment and civilization among the agricultural and trading classes. The idea that the education thus given qualifies a boy for government employment is strongly discouraged. The great majority of the boys educated in these kuttabs will work on the land or engage in private trading or enterprise. A few only whose parents can afford to pay higher fees or who are particularly bright will continue their education in primary schools. At Tokar and Berber there are agricultural sections attached to the schools. The schools are staffed by native teachers trained in the Gordon College and paid by Government. In 1908 the first kuttab for girls was instituted at Rufaa in Blue Nile Province. This school numbers more than 50 girls. There are now others at Kamlin, Dongola, Merowe, and El-Obeid. In 1920 there were 75 kuttabs which educated 7,610 boys and 309 girls. The cost of vernacular education is met partly from Local Education Rates, which figure only in the Local Provincial Services Budgets, and partly from contributions by the Central Government which are under different items in the Budget of the Education Department. During the year 1920 the sum of £E.19,819 was provided by the Local Education Rates, of which £E.1,984 was either expended on non-recurrent charges or passed to the various Reserve Funds, and £E.8,714 was provided by the Central Government, a total of £E.27,545. This figure does not include the cost of inspection or the cost of the Elementary Training College in Khartoum. The cost of education worked out in 1920 to about £E.4.000 mms. per head.

*Primary Schools.*—These schools are intended for the sons of government employees and of better-off classes of natives. Their purposes are :

1. To feed the Upper School of the Gordon College, and supply cadets to be trained in the Military School.

2. To fill junior positions in government or private employment, e.g. telegraph and telephone clerks in the Posts and Telegraphs, or the Railway Departments, junior clerks, store-keepers, &c.

3. To give a general education in elementary subjects to sons of merchants or landowners who are afterwards destined to manage their fathers' estates or business affairs ; such boys will, however, usually continue their education in the Upper School.

The age regarded most suitable for admission to the first-year class is eight to eleven. There are Primary Schools at Khartoum (Gordon College), Omdurman, Atbara, El-Obeid, Suakin, and Wad Medani. The fees in these schools vary from £E.4 to £E.7.500 per annum for day-boys, and there are boarding-houses in the Gordon College at Atbara where nearly 400 pupils (Primary and Secondary) are housed at a fee from £E.20 to £E.25 per annum. The subjects of secular instruction are Arabic, English, arithmetic, geography, geometry, drawing, elementary land measuring, drill, and gymnastics. Manual instruction is taught in the Gordon College Primary School and Wad Medani Primary School, and it is hoped to extend it to all such schools. Candidates must pass an entrance examination held in each of the Primary Schools about the beginning of January (annually), date advertised. The total number of boys in the Primary Schools in 1920 was 1,106 and 135 presented themselves for the final examination of the fourth year, of whom 100 satisfied the examiners, 59 being accepted in the Upper School. Troops of Boy Scouts have been started in the Gordon College, Wad Medani, and Atbara Schools.

Although the Primary Schools are unable to satisfy all the demands for employment which are addressed to them by Government Departments, &c., the situation seems hardly to justify the opening of additional schools. In 1920, 261 boys left the Primary Schools, of whom only 20 had not found employment in 1921.

*Upper School.*—The Upper School of the Gordon College,

which is open to boys who have satisfactorily completed their primary course, provides a regular secondary course which is designed to last for four years ; it also contains various special sections in which definite vocational training is given.

In the Secondary Section the usual secondary subjects are taught with the exception of physics and chemistry, for which there is at present no laboratory accommodation, but with the addition of elementary mechanics and manual instruction.

The special sections are as follows :

(1) *A Kadis' Section* intended to qualify students for responsible positions in the religious law courts which are under the legal department. The course provided in this section lasts for five years and includes the study of English in addition to the special studies connected with Mohammedan law. Boys are admitted to this section as soon as they have passed the examination qualifying for admission to the Upper School.

(2) *An Engineers' Section*, where overseer engineers and surveyors are trained for subsequent employment in the Departments of Public Works, Irrigation, Surveys and Railways. Boys are admitted to this section only after they have completed the first two years of the secondary course.

(3) *A Teachers' Section* for the training of teachers for work in the Primary Schools.

(4) *A Traffic Section*, which is located at Atbara, for the training of boys for work in the traffic department of the railways.

To both these sections boys are admitted only after they have completed the first two years of the secondary course.

The total number of boys in all divisions of the Upper School in January 1921 amounted to 180.

*Instructional Workshops.*—In these workshops (at Gordon

College and at Omdurman) boys are trained to various trades. The shops are under the management of English managers and assistants aided by Egyptian artisans. The course of instruction lasts not more than five years ; it is less in the case of boys who do well. An agreement must be signed on admission by every boy and his parent and guardian. The most suitable age for admission is fourteen, and boys must have previously attended a kuttab.

1. *Gordon College*.—These workshops accommodate about 180 apprentices, there were actually 118 in 1917 as compared with 143 in 1916, the decrease being due to shortage of timber. Food and lodging may be provided free for those who have no relatives in Khartoum with whom they can stay. Practical instruction is given in carpentry, smith's work, fitting and machine running ; the elements of arithmetic and drawing are also taught.

2. *Omdurman*.—The instruction here is divided into (1) stone-cutting, building, and masonry work under the supervision of an English instructor, and consisting chiefly of squaring and dressing stones and simple ornamentation ; (2) pottery under a skilled Egyptian artisan from Kena. The shops have accommodation for some 55 apprentices, the maximum number being instructed in 1920.

#### *Gordon Memorial College : Research*

The gift of the Wellcome Research Laboratories to the Gordon College in 1902, and their restoration after the fire of 1908 through the munificence of the founder, have been of the greatest value to the Sudan. Researches are carried on regarding the diseases of man, beast, and plant in the country, soil and water examinations, fuel problems, &c., and are of abiding scientific and practical importance. The results are published in the Wellcome Reports.<sup>1</sup> The researches

<sup>1</sup> Up to 1911 published in special volumes.

are bacteriological, chemical, and entomological. In addition geological and archaeological work is done. The outbreak of war in 1914, with the consequent unavoidable economies, naturally reduced the output of the research departments, but did not result in any real detriment to the highest interests of the college.

The Research sections of the Government are, for the most part, attached to the Education Department and housed in the Gordon College.

The British staff now (1920) engaged in these laboratories numbers sixteen.

The Geological Survey (Staff, Government Geologist and one Assistant Geologist) is also housed in the Gordon College, as are the Antiquities Service with an Archaeological Museum and the Natural History and Ethnological Museums.

The Government Botanical Section was at one time attached to the Education Department but was transferred to the Department of Agriculture in 1920, and the Pearl Fishery Service with two Marine Biologists is attached to the Red Sea Province.

In 1916 the Arifs' Training College, the special nursery for the staffing of kuttabs was transferred from Omdurman to Gordon College. The Primary School attached to Gordon College draws the bulk of its boys from Khartoum itself, and Egyptians predominate among them, but, in 1915, in addition to 117 Egyptians and 77 natives from the immediate district, it contained boys from the following Provinces : Blue Nile 20, Sennar 7, White Nile 13, Kassala 1, Berber 6, Dongola 6, Red Sea 2, and Kordofan 7.

The following was the number of students at the beginning of 1916 :

Upper School (Engineers and Literary Sections First Combined Year).	72
Sheikhs (Teachers and Kadis)	19
Arifs' Section	37
Primary School	296
Workshops	121

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545

In 1920 the following statistics of school attendance were given :

School.	No. of Pupils.	Nationality.					Egyptians.	Miscellaneous.
		Natives.						
		Arabs.	Blacks.	Berberines.	Mixed.			
Gordon College Upper School . . . . .	117	57	2	7	32	17	2	
Gordon College Training College . . . . .	81	75	—	—	6	—	—	
Primary Schools . . . . .	1,106	462	100	22	219	277	26	
Industrial and Agricultural Sections . . . . .	227	84	62	10	52	18	1	
Totals . . . . .	1,531	678	164	39	309	312	29	

Of these pupils, 1,363 were Moslems and 164 Christians, while 4 were classified as miscellaneous.

#### LAND TENURE

The whole question of land tenure in the Sudan is an intricate one, and no general principle can be laid down, or is in practice applied. Land settlement has been systematically carried out in the Northern Provinces and the Gezira only, and the procedure in one district cannot be taken as typical of all. Rights of ownership vary widely in kind and extent in different districts and the same terms are employed with different meanings ; native titles to land are often vague in the extreme, and have been complicated by tribal or communal ownership and by forced dispossession during the Mahdia. Moreover, the Moslem law of inheritance, which is administered by the Government in Arab districts, permits of a large number of sharers in a property, some of them holding, perhaps, minute portions only. The Government has been patiently endeavouring year by year to reduce the problem to order, and to stop the perpetual disputes over land-ownership, by the registration of titles, recognition of just claims, demarcation and survey, and the leasing out of lands to native cultivators on fair terms. The successive Land Ordinances are constantly being amended and supplemented.

A brief account is given of enactments concerned with

ownership, expropriation and compensation, sales, survey, town lands and land taxation, and scale of taxation. These ordinances apply to the Provinces of Dongola, Halfa, Berber, Khartoum, and parts of Sennar, Blue Nile and White Nile ; in the Red Sea, Kordofan, and Kassala Provinces no settlement has been carried out, much of the land in the two former being incapable of cultivation except in the *wadis*, while the valuable cotton-growing lands round Tokar are Government property. Among the Dinka, Shilluk, and other negro tribes of the south, no land settlement has been needed or attempted ; there is plenty of land for all, so that disputes very rarely arise, and the land is, as a rule, held tribally rather than by private ownership. Several of these peoples have somewhat complicated laws of inheritance, with which the authorities do not interfere, so long as peace is maintained.

*Types of Land in Dispute.*—Lands possessing a permanent water supply are, as a rule, held in full ownership, with their limits clearly defined ; those with an intermittent supply are more vaguely owned, and are sometimes considered tribal or communal property ; the Government is usually considered the owner of lands where dearth of water renders cultivation impossible.

River-land presents two broad categories, (1) *sakia* land, (2) *seluka* land. *Sakia* land is land irrigable by means of *sakias* or *shadufs*, whether on the mainland or an island. In some districts, partly owing to shortage of labour, much land formerly cultivated by *sakia* or *shaduf* has gone out of cultivation, especially where, as in the Blue Nile Province, rain-land exists side by side with it. In 1903, in order to encourage the erection of *sakias*, land tax was postponed for one year on land irrigated by a newly installed *sakia*, provided it had not been taxed in the previous year. *Seluka* (in some districts called *garf*) is foreshore land irrigable by the natural flood of the Nile. River-land is the dominant type of cultivation in the Halfa, Dongola, and Berber Provinces, the approximate northern limits of annual rain cultivation being lat. 15° 30' E. *Seluka* or *garf* land is



bounded on the river side by the river water at low Nile ; on the inland side, by the highest limit of the flood water not carried off by khors ; the river limit (*mog el-sef*, i.e. summer wave) is usually mentioned in documents of title to such land ; the inland limit (*hassa*) is more difficult to define, and is often disputed. The *hassa* divides the *garf* from the land known as river *bugr*, which is flooded by khors or, in a year of high Nile, by the river. Sloping down behind this again from the rain-land plateau is the *hadab* or rain *bugr* ; disputes between owners of *garf* land and *bugr* land are very frequent. When there is no cultivation behind the *garf*, its owners will claim as far back as to the rain-land. River-land holdings thus usually consist of a number of narrow strips whose width and river frontage are carefully demarcated, while they run inland indefinitely. In most districts *garf* land is measured lineally, by the *habl* (rope) and *ud* (rod), instead of by the square, and rain-land by the *gadaa* (=circa  $5\frac{1}{4}$  feddan) rather than by the *feddan*.

Rain-land (*dahara*) may be on the river bank, or at a distance from it. The former, called Rain *bugr*, is land cultivated at the foot of the sloping bank by means of high earthen banks (*teras*, plur. *terus*), which hold up the rainwater. Owners of rain *bugr* always claim considerably more land (i.e. the higher land down which the water flows) than is actually under cultivation ; the latter alone is usually registered as theirs, the former as the Government's. In the case of river *bugr* the land is registered to the owner where cultivation, though not annual, is frequent ; where cultivation only takes place at long intervals the land is registered to the Government, with rights of cultivation for those who can prove their claims. Where rain-land has been cleared and provided with *terus* its private owners are always known and recognized by the tribe, even though the land may be spoken of as a tribal possession.

Land at a distance from the river holds water more easily than that on the sloping river-banks, and is consequently preferred, in districts where the rainfall is steady and sufficient ;

a more settled population is usually found in such districts than in others where, when the season of rain cultivation is over, cultivators remove to the river. The exhaustion of soil in the White Nile gum gardens is another cause of periodic removal, sometimes of whole villages, to fresh cultivable sites. In this district the land passes through a series of stages, under successive crops, with differing conditions of ownership. There is first virgin soil (*ghufar*), or land on which no traces of previous cultivation remain ; this has no individual owner, but belongs to the tribe or section. Then it becomes cultivated (*bildat*), bearing cereal crops for a period varying from 4 to 10 years, during which time immigrants from outside the village or district are encouraged to clear and take up land, theoretically paying ground-rent (*tugundi*) to the local sheikh or some other notable. At the end of this period the soil becomes exhausted, but in the course of a few years is covered with a growth of wind-sown gum acacias, which develop into a so-called garden (*geneina*). Natives of the village or tribe who have cultivated the land in the *bildat* stage are entitled to shares in the *geneina*, but the outsiders are not, and what would be their shares accrue to the sheikh. The latter is thus always anxious to encourage immigrants, and often remits the ground-rent to that end. At the close of the *bildat* stage the village moves to a new site, where cultivation is started ; the former immigrants probably have a right to cultivations here. Those who clear the land have a right to it for the whole cultivation period.

The ownership of pasture lands is always tribal, and is closely bound up with the possession of wells and watering-places.

*Ownership.*—Under the Egyptian Government all land was *kharagi*, i. e. the prize of victory, and was vested in the Government, but subject to the payment of taxation. Subject to this, private ownership was recognized in the case of all land artificially irrigated and of rain-land under permanent cultivation. Land intermittently cultivated was regarded as Government property, and the cultivators as

tenants at will. On the Anglo-Egyptian reoccupation of the country private ownerships were still recognized, and their registration was undertaken by Government, under the Lands Ordinances of 1899 and 1903.

An absolute title to ownership was considered to be established by continuous possession for five years immediately preceding date of claim or by the receipt of rents or profits during that period. A *prima facie* title, in default of any claimant with a superior title, was created by continuous possession since the reoccupation.

Waste and unoccupied land, including land which at the time of settlement under the Land Settlement Ordinance of 1905 had not been in continuous occupation for the previous five years, and land cultivated at irregular intervals, was by this ordinance, until the contrary should be proved, presumed to be the property of the Government. Partial rights such as the right of pasture and the right to forest produce are, where proved, recognized and recorded, but anything short of full ownership is insufficient to invalidate the Government's title. Even in the case where land only cultivable at irregular intervals has been so cultivated for whatever period, a title to absolute ownership is not thereby established.

Private rights, whether absolute or partial, are subject to the legal right of the Government to expropriate.

By the Land Acquisition Ordinance of 1903 the Government was empowered, when land in any locality is required for public purposes, to buy out all private interests at a price fixed by agreement, or failing that by arbitration, with an appeal from the arbitrator to the principal civil court of the Mudiria. This right can be exercised by the Government on behalf of a private individual or company which intends to use the land to the public advantage, and subject to conditions which may be imposed by the Government.

The Land Settlement Ordinance of 1905 also contained provisions enabling the Government to buy out, under the same conditions, partial rights over waste forest and unoccupied lands. In the second case compensation can be made in both

money and land. A grant of land has usually been found preferable to a money payment, the natives often not desiring the latter, or squandering it when made.

The Government exercises frequently the powers conferred on it by these ordinances.

The question of ownership of land in the big towns was determined by commissions appointed under various Ordinances. The commissions which investigated claims in Khartoum, Berber, and Dongola were governed by an Ordinance of 1899, amended in 1901, which was in 1904 applied to the towns of Kassala, Gedaref, El-Dueim and El-Obeid. Suakin and Omdurman were legislated for specially in Ordinances dated 1904 and 1906 respectively.

By the Ordinance of 1899 town land was divided into three classes, namely, building land, garden land, and land under cultivation, and the Government was empowered to purchase at a price fixed by the commission land in the last two categories. With regard to land other than these two kinds, to which a claim had been established, it was enacted that there should be allotted to the owner a piece of land in the town of equal or greater area and that all claims to ownership or other interest in the original land should be thereby extinguished. The new grant carried with it the obligation of erecting suitable buildings within a specified period under penalty of forfeiture to the Government. The title conferred by such a grant, though not stated, is presumably freehold. Town land, other than garden or cultivated land to which a claim is recognized but which is not purchased by the Government and other than land allotted as above, was declared to be Government property.

In the case of Omdurman, which was dealt with under a Proclamation of 1906, it was assumed at the outset that the land was the property of the Government. Subject to this and the reservation of the Government's right to the sites of all market places and vacant lands and the sites of uninhabited houses, claims to private ownership and other rights, if substantiated, were allowed.

In the Provinces of Halfa, Dongola, Berber, Khartoum, Blue Nile, and parts of White Nile a register of titles to land, accompanied by a cadastral survey, had been prepared by 1912.

Cases of disputed ownership between natives constantly arise, and are often difficult to settle ; this task is entrusted to a registration officer on the spot, who hears both parties, questions the local sheikh or other notables on oath, examines documents, and gives his decision. Ownership of areas less than a fixed minimum is not registered. If one of the parties is dissatisfied, he may petition the settlement officer. The causes of dispute are often the disturbance or destruction of boundary marks ; the division or sale of property among the respective heirs ; the boundaries of ownerships abutting on the *haram*, or village common land ; and claims of tribes within whose boundaries a village of a neighbouring tribe is situated. The last class of dispute often arises on an attempt to sink a well.

Native mortgages have also been a fruitful source of litigation. They have been left unredeemed in the most casual way, and the mortgagor has seldom possessed any documentary evidence. As the general custom has been for the mortgagee to enter into possession, it is often difficult to prove, after a generation or more of such tenure, that he is not the owner.

Another difficulty in settling disputes frequently arises from the absence of one of the necessary parties, who may cultivate his lands during the rains and travel or live in distant provinces at other seasons.

*Demarcation and Survey.*—By the Demarcation and Survey Ordinance of 1905, it was enacted that Government has the right, after due notice given, to demarcate and survey any land and to order the erection and maintenance by the owner or occupier of stones or posts as boundary or land marks. Sheikhs of villages are responsible for such marks and must immediately report their loss or damage to the Mamur. Individual ownerships are defined by stone, or in

some districts, by mud pillars, between which the boundary is supposed to run in a straight line ; any change of direction in the boundary thus requires a pillar. In the Gezira, every portion of land, cultivated or uncultivated, under Government or private ownership, except roads, must be marked by an iron upright bearing a plate on which the demarcation, afterwards the registration, number is painted. To avoid the expense of a number of these pillars and posts, several heirs often ask to be registered under one number, although the land has been previously partitioned among them ; the registration officer, however, seeks to ensure that every separately owned plot shall be separately demarcated, mapped, and registered.

*Government Land.*—One of the results of the work of the various Land Commissions is that large areas of land in the Sudan have been declared to be the absolute property of the Government. This is notably the case with lands in the towns.

The uncertainty of water supply has influenced the Government in its treatment of agricultural land declared to be the property of the State. The general practice is to lease such land for short periods only, and for riverain land annual and biennial leases are common. In Berber land irrigable by wells was in 1911 let for a probationary period of four years during which the lessee was expected to plant 150 date-palms, sink a well, and construct a *sakia*. During this period the land pays only a graded proportion of the land tax ; at its completion, the conditions having been fulfilled, the land is granted in freehold. The short lease system, however, applies only to transactions with natives who are incapable of constructing extensive and permanent irrigation works.

Town land has been mostly regarded as Government property and up to 1913 it was sold or leased on terms which varied with each town, and within each town according to the position of the site. Outright sale was more popular than lease and where there was a prospect of the land being put to good use and the price obtainable was adequate, the

Government sold outright. But to guard against speculators a good deal of town land has been leased on renewable leases of from fifty to eighty years. In undeveloped towns or in the outlying settlements of big towns where buildings were of necessity only of a temporary nature, the term of the lease was shorter. In many cases where the land has been put to good use the Government has at the desire of the tenant converted the leasehold to freehold.

Up till recently therefore conditions of tenure in towns have adapted themselves to local circumstances. In 1913 the work of standardizing the tenures in different towns was undertaken by the Lands Department, and in this connexion greater powers were conferred on the provincial governors. Information as to the principle or details of the new scheme is not available.

By the Government Town Lands (Native Occupation) Ordinance of 1912 it was enacted that the Governor of a Province may permit natives frequenting a town to build a village outside it on Government land, such a site to be called a 'native lodging area'. The Government reserves to itself the right to eject the occupiers at will, and to affix certain conditions and regulations as to public health, order, and so forth. Town lands are thus occupied round Khartoum, Halfa, El-Obeid, Port Sudan, El-Dueim, and other towns.

*Sales.*—By the Natives Disposition of Lands Restriction Ordinance of 1918, following on several earlier enactments, notably a Proclamation of 1905, it was enacted that no native may sell, mortgage, or otherwise dispose of any land or of any right or interest in or over the same without the written consent of the Governor of the Province; such consent, however, was not required to a devise by will, or lease for a period not exceeding three years. The latter, however, may, at his discretion, recognize bona fide sales between natives where the application for his consent has been delayed, if he is convinced that the transaction was a fair one, and that there was no intent to deceive the Government. In practice the

refusal of consent is exceptional. All sales, mortgages, and purchases of land by Europeans are similarly invalid, unless approved by the Governor. Buyers of land, who are not natives of the Sudan, pay a fee towards the expenses of the Government cadastral survey.

Rights of cultivation can subject to the consent of the governor, be sold; for example, this was permitted in the case of bugr land in Khartoum Province, which was largely Government property, by a Proclamation of 1908. In this Proclamation the Government declared its intention of releasing its ownership, in some cases, in favour of persons with rights of cultivation and such land is sometimes sold by auction, payment being made by instalments. When ownership is sold to cultivators, mines and minerals are excepted, and certain conditions as to occupation and cultivation are usually appended. The land then becomes liable to land tax after the expiration of the first year (see p. 322).

*Concessions.*—In the first years after the reconquest the Sudanese Government was naturally averse from permitting the alienation of large areas of land to private individuals or companies before the rights of the natives had been ascertained. As the work of settlement progressed concessions began to be made by the Government, which was fully alive to the value of private enterprise in the work of developing the country. Concessions are arranged by private treaty and the terms of the various contracts are based on those recommended in the report of a committee of Egyptian and Sudanese officials which sat to consider the whole question of land concessions.

*Moslem Law of Inheritance.*—On the death of a landowner his property is divided up among his heirs by common consent, or, sometimes, kept undivided, each heir having a right to his share in it. Such shares are elaborately fixed among members of the family by Moslem law, in order of precedence, the amounts varying with the number of co-heirs. Not more than a third of the property may be devised by will. The head of the family sometimes takes the whole property,



making provision for the co-heirs, but each of the latter has the right to demand his share within 33 years. In some cases sakia land is divided up, while bugar, which is not cultivated regularly, is left in joint ownership. Where partition is desired by one party and it cannot be arranged by consent the Registrar of Lands refers the matter to the court of a magistrate.

Cases of disputed succession, in common with other family matters, are tried by special courts, Mekhema Shariya, the judges being Moslem sheikhs, subject to the Grand Kadi. The Grand Kadi is also administrator-in-chief of *wukf* lands, i.e. those of charitable endowments, the income of which is devoted to religious purposes, such as the upkeep of mosques and their staffs. Several of these endowments exist at Khartoum and elsewhere, e.g. Wad Medani, but they are few in number, and not at all so important in the Sudan as are, for instance, the similar *habus* lands in Morocco.

*Taxation.*—Rainland pays the ushur, or tithe of produce, all other classes of land are taxed according to their value; both ushur and tax are sometimes remitted or abated when, through no fault of the cultivator, crops have failed. By the Land Tax Ordinance of 1905, amending that of 1899, the scale of taxation was fixed as follows:

1st rate . . . . .	P.T. 60 per <i>feddan</i>
2nd rate . . . . .	P.T. 50    „
3rd rate . . . . .	P.T. 40    „
4th rate . . . . .	P.T. 30    „
5th rate . . . . .	P.T. 20    „
6th rate . . . . .	P.T. 10    „

(These rates may possibly have been altered since. See p. 298.)

These rates supersede the six categories of the 1899 Ordinance, viz.: 1st and 2nd class sakia land (island); 1st and 2nd class sakia land (mainland); seluka land; and land irrigable from wells (*mataras*)—for which the tax was identical with the above rates in each case except that of the *mataras*, where the 1899 Ordinance fixed 20 P.T. as against the 10 P.T.

of the 6th rate of 1905. It is left to the discretion of the local official, who is furnished with guiding instructions, to determine under which of the six rates any given land should be classified.

Date gardens are also taxed per tree.

Following on the Ordinance of 1899, the system of progressive taxation to which allusion has already been made was introduced, with success in Dongola, but less favourable results elsewhere. The scheme was as follows. Any owner holding more land than he could reasonably cultivate was encouraged to give up the surplus in trust to Government for a period of 19 years. Of the land retained by the landowner, such portion only was taxed as was actually being cultivated, and the remainder, that is the uncultivated area, if any, was brought under the system of 'progressive taxation'. It would pay no tax for two years, after which it would be gradually taxed; every two years a fixed part would be added to the tax-paying land, until the owner was paying tax on the whole area. In Dongola Province the scale was  $\frac{1}{4}$ , increasing to  $\frac{1}{2}$  at the end of four years,  $\frac{3}{4}$  at the end of six, and the whole at the end of eight years, but in other provinces the increments were by  $\frac{1}{5}$ , the whole scheme thus taking ten years. The untaxed portion is called *bur* (lit. 'uncultivated'). Whenever a native took back land originally given up, or took up a new area of *bur* land from Government, this progressive taxation was to be applied; in some districts large areas of such land are now in native ownership. In others however, where the land was in a wild condition, or under forest, it was found that the owners could not easily cultivate it, and that they were constantly in arrears with the tax, which had time after time to be remitted; the system had accordingly to be abandoned.

*Minerals.*—Metals, minerals, mineral substances and precious stones lying in, under, or on lands in private tenure or untenanted lands were declared by the Mining (Prospecting) Ordinance 1899 as revised by the Revision Ordinance 1906, No 1, to be the property of the Government. Licences are

granted for prospecting over defined areas for limited periods. Application can afterwards be made for a mining lease.

Private landowners do not require prospecting licences but they must in common with licensed prospectors notify the Government of any discovery. No one can begin mining operations without first having obtained a mining lease or other authority from the Governor-General.

## CHAPTER VIII

### ECONOMIC GEOGRAPHY

General survey—The Nile régime—The Nile flood (Summary)—Irrigation.

#### INTRODUCTION

THE Sudan comprehends regions distinguished from each other by the differing compositions of the soil, the régime of the rainfall and the water-courses, by different flora, fauna, cultivation, and natural products, and by the races and levels of development of the inhabitants.

In a general way the natural divisions are traced by the two Niles and their affluents. The regions which these water-courses traverse may be distinguished according as their surface is covered by sand, pasture, cultivable soil, marshes, or forests. Where the land is adequately watered by the rain or covered by the flood-water of the rivers the soil is almost always capable of yielding a good return, if the flood can be readily drained off. Every vital activity is not, as in Egypt, bound to the Nile. Apart from the other water-courses and wells, there is in the south a considerable though somewhat unreliable rainfall, so that cultivation over great areas is possible without artificial irrigation.

The chief natural resources of the Sudan lie in the forests of Kordofan, the Blue Nile, and Bahr el-Ghazal, which produce gums, resins, bees-wax, ebony, furniture woods, timber, tanning products, rubber, fibres, and oil-yielding products; in the spoils of animals, such as ivory, ostrich feathers, rhinoceros horns, and skins; in minerals, including salt and mica; and

in wild products, such as senna. In the days before the Dervish revolt the chief export of the Sudan was gum from Kordofan, and it remains so to this day. These great reserves of natural products are far from being inexhaustible, and it is in the direction of improved and increased agricultural production and stock-raising that the economic progress of the Sudan must lie. The obstacles opposed to this are the inadequacy of the system of irrigation and of communications, the scarcity of labour, the ignorance of the natives, their want of resources, and the insufficiency of trading facilities.

While the Sudan is in many ways well fitted to be a great agricultural producing area, the extremely favourable view of its capabilities expressed by some observers perhaps occasionally takes too little account of these great disadvantages, especially in regard to water and population. Not to give full weight to these very obvious considerations, and merely to enlarge on the excellence of the soil and the wide range of products found within the Sudan, would be utterly misleading. It is perfectly true that it could grow most cereals, rice, cotton, oil seeds, sugar cane, spices, and nearly all the more important tropical and sub-tropical products, that it is rich in fibre-producing plants, and that a great extent of its territory is in the rubber-producing zone, and that it has mineral resources; but it is not practical to speak at present of the successful and remunerative development of all these considerable possibilities, and it may be that some of them will remain permanently incapable of satisfactory exploitation.

The actual fertility of the land varies enormously, from the sterile wastes of northern Kordofan and the eastern Sudan to the rich soil found bordering the river banks or in large tracts apart from them, as round Gedaref, Kassala, and Tokar, where rich crops are grown with little effort. Except in certain areas, the people, generally speaking, grow little beyond what they require for their own use. The principal crops are *dura*, *dukhn*, cotton, sesame, maize, earthnuts, *lubia*, wheat. In the Gezira, however, and in the Gedaref

## INTRODUCTION

and Tokar districts, and along the Nile banks in the north, large tracts are fairly heavily cultivated. Dongola and Halfa Provinces are rich in date-palms, and export large quantities of dates. There is a great opening for the growth and export of cotton. Relatively to the area cultivable little cotton is grown at present, but the soil is favourable in many places, and cotton of good quality can be produced in many parts of the country. It is essential that the government should conduct, as it is doing, thorough experiments in the matter, and that private schemes should be under adequate supervision. A few miles north of Kassala the Gash fans out and floods a large area of extreme fertility that has been built up by its silt-laden waters. This land grows excellent cotton, but the area cultivated is small, mainly owing to lack of rail communication and consequent difficulty in exporting. It had only increased during the ten years up to the War from about 3,000 to 9,000 acres, but it has been estimated that if transport facilities existed to export the produce, the cultivated area might increase to 100,000 acres or more in the next ten years.

There are considerable mineral resources, but in very inaccessible parts. There are large numbers of cattle, especially in the upper White Nile, Bahr el-Ghazal, Kordofan, and Kassala. Sheep and goats are numerous in the central parts of the country.

General Gordon's opinion that the Sudan was a worthless country that could never pay its way can certainly no longer be accepted. It is unquestionably a country of great potential wealth, but its development has been and is greatly hampered by the difficulty and expense connected with the provision of anything like adequate irrigation and communications. So long as camel transport over few and bad roads alone existed, trade could not develop except in articles of luxury small enough in bulk to defray expensive carriage; hence the great majority of the population had no incitement to produce beyond their own requirements, and merely, so to speak, paid their way. What the government has done to improve

irrigation and communications, an immense task which it has attacked with the most scientific thoroughness, and so as already to produce great and far-reaching improvement, is fully discussed under the two heads.

The construction of the railway to Port Sudan and the extension of the line south of Khartoum into the rain districts has greatly accelerated the economic development of those parts of the country brought within range of rail transport. When the railway is built connecting the Red Sea line at Thamiam with Kassala, Gedaref, Mafaza, and Sennar another fertile tract will be opened to trade and a further stimulus given to production.

The variability and occasional insufficiency of the annual rainfall over most of the Central Sudan will always tend to hamper agricultural enterprise, but the effect of inequality of rainfall will be greatly minimized by railway extension, as the failure of the rainfall is generally local, and improvement in transport facilities will help to maintain a general average of output from the country as a whole. In the central zone, therefore, which is also the most populous, the more the basis of production can be strengthened by providing an assured water supply by means of economical irrigation schemes the quicker will agricultural methods improve and the greater will be the output of produce with a high export value, such as cotton and oil seeds. With an insecure water supply the cultivator will usually limit himself to the production of a modicum of grain for his own food supply and is not immediately concerned with the export value of his crop.

It will probably be many years before the railway penetrates into those southern parts of the Sudan, where the annual rainfall is relatively copious and regular. These districts are very remote from foreign markets, the population is scarce, consisting largely of negroid tribes in a primitive state of development, and only products of high intrinsic value and small bulk could be exported owing to the necessarily high cost of carriage. The Nile and its tributaries will continue

to provide the means of transport for these districts for a considerable time to come, though, no doubt, feeder lines of light railways will eventually be constructed down to the rivers in certain promising areas. The discovery of valuable mineral deposits anywhere in the southern Sudan would, of course, modify these considerations as to transport development.

### GENERAL SURVEY

The main feature of the Sudan is flatness. With the exception of the Nuba Mountains, which lie in a confused mass parallel to the White Nile between lat.  $10^{\circ} 30'$  and  $12^{\circ}$  N., and of the Jebel Marra in Darfur, the general superficies is an immense plain broken here and there by small rocky hills standing straight out of the surface of the plain. As the plain recedes further and further from the Nile, these hills become larger and more numerous, till they merge on the east with the main formation of Abyssinia, and in the west spread into the mountain country bordering on the Sahara to the north of Wadai.

The character of this great plain varies according to the latitude. North of Khartoum, where there is little or no rain, the desert is for the most part bare. South of it a small scrub covers the area not under cultivation, and the amount of vegetation gradually increases as the southern latitudes are reached. Even in the south, however, there is little of the luxuriant, so-called 'tropical' forest country.

The towns and villages are naturally confined to the sources of water supply. Hence in the north the population is limited to the river banks, except for a small number of nomad Arabs. The villages in this part of the country are now mostly of mud brick, and in various places, such as province head-quarters, or the like, become small towns, such as Halfa, El-Damer, Berber, Atbara, and Shendi.

Farther south a number of small towns are to be found on the Blue and White Niles, e. g. Medani, Singa, El-Dueim,



Kosti, but the higher annual rainfall offers a means of existence to a sufficient population to admit of the growth of towns away from the Nile, e.g. Gedaref to the east, El-Obeid to the west.

The vast region comprehended between the frontier of Egypt and lat. 20° N. is an arid, sandy desert, traversed from north to south by a straight and fertile oasis formed by the banks of the Nile. Its eastern part, the Atbai, which extends from the railway to the Red Sea, is a plateau of sand, sandstone, and granite, furrowed by wadis.

To the south of lat. 20° N. is the district of Suakin and Port Sudan, the old and modern maritime ports of the Sudan, united by a railway with the Nile and Khartoum, which stretches along the coast to the frontier of Eritrea. The best part of this district is the alluvial plain of Tokar, where cotton plantations have given good results.

The great region enclosed by the Atbara, the Blue Nile, and the Nile proper, sometimes known as the island of Meroe, is a territory that is little homogeneous; in great part sterile, in the south and south-east there are cultivable lands watered by the rains, while on the east are pasture lands. This region is prolonged by that of Gedaref, which extends between the Atbara and the Rahad. The southern part of this district forms a fertile plain.

The best part economically of the Sudan in the present condition of transport and population is the long peninsula formed by the Blue and White Niles, known as the Gezira, especially the triangle, the apex of which is Khartoum and the base a line drawn between Sennar and Goz Abu Goma, and round the southern and eastern boundaries of which the railway runs. Below this line there are other fertile districts, but the population is scanty and communications are bad owing to lack of water during the dry season. Further south are forests.

The Gezira has always been one of the most populous parts of the Sudan, as its rainfall, though variable, suffices for the production of good average crops, save in exceptional droughts.

It is easily accessible by the White and Blue Niles. Slave labour used to be employed for cultivation, the dominant race being Arab.

Proceeding south along the frontier of Abyssinia, one reaches beyond lat. 12° N. the lands of the Fung, of the Burun, and, on rejoining the White Nile, that of the Shilluk and Dinka. Here the people are occupied principally with cattle-raising.

The southern provinces east of the Nile are potentially productive, but little developed, and, in the case of Mongalla, as yet inadequately investigated.

The country on the west side of the Nile is now considered, proceeding from south to north.

The region of the Bahr el-Ghazal is for the most part marshy, but with plateaux, clayey plains, pasture lands, and forests. It has considerable natural resources including wood, ivory, rubber, iron, and copper, but is very inaccessible.

As a whole Kordofan is a badly watered and drained plain, rising here and there into hills, and furrowed by moist wadis and khors. It is rich in gum trees and at one time produced a considerable quantity of ostrich feathers. Iron is found here. Its nomadic population is large, breeding camels, and having herds of cattle, goats, and sheep. Those of the inhabitants who are sedentary cultivate cereals and oil seeds, and possess plenty of cattle.

Darfur is similarly a vast sandy plain with fertile spots, which are more congregated in the massifs of the centre. In the south-east the region traversed by the wadis joining the Bahr el-Arab contains iron and copper. Darfur has considerable resources in the shape of live stock, camels, gum, &c.

Dongola, largely barren plains covered with drift sand, yet has a narrow strip of rich soil on the banks of the Nile. It has fair communications, except in the north. Its development is hampered by lack of natural pasturage.

The principal factor responsible for the distribution of the

forests, in which are the great natural resources of the Sudan, is the amount of annual rainfall in the arid, semi-arid, and evergreen zones, while the riparian forests possess characteristics governed by the moisture of the rivers and streams which nourish them. Owing to the great depth below the surface of the permanent water table in the arid zone, broadly speaking, north of lat.  $17^{\circ} 30' N.$ , where the annual rainfall is less than 10 inches, and in the northern parts practically nil, the trees are mostly short-stemmed and stunted acacias, with some broad-leaved trees and small scrub. The principal wooded areas lie between lat.  $13^{\circ} 30' N.$  and  $17^{\circ} 30' N.$  Where the rainfall is less than 4 inches tree growth ceases. The forests of Kordofan, which come within this zone, are commercially the most important in the Sudan, including as they do the acacia yielding the best gum-arabic.

The zone with an annual rainfall ranging from 20 to 40 inches, has the largest area of forest growth in the Sudan. It has not only the rubber vine, but also some of the largest and best timber trees.

In the extreme south the rainfall is higher and in this area are found a number of evergreen forests. These occur in the southern half of the Lado in the Yei River valley. They are especially remarkable for the great variety of evergreen trees of gigantic size, the luxuriance of the vegetation, and the total absence of grass. Confined to the main river, Yei, and its tributaries south of lat.  $4^{\circ} N.$ , they constitute the so-called gallery forests. The proportion of trees of large size is much greater than in any other type of forest in the Sudan. The most important tree from its size and the utility of its timber is the mahogany, *Khaya sp.* (not yet identified). Trees 6 ft. in diameter, with a height of 120 ft., are not uncommon. Forests of male bamboos are extensive, and canes are to be found in the deep moist valleys. This type of forest contains a wealth of most valuable timber of many kinds unobtainable elsewhere in the Sudan, but its exploitation would probably be uneconomical without the construction of light railways.

The most important of the riparian forests are those on the White and Blue Nile and on the Rahad and Dinder. The comparatively small number of species occurring in this type of forest is noticeable as compared with forests which owe their origin to rainfall only. The most important species in this riparian zone is the *Acacia arabica*, which forms forests wherever the land is subject to annual inundation. This tree is of great economic value as a source of native timber, as an excellent fuel for raising steam, and also for its tannin. Other trees to be met with are the dom palm, the tamarisk and tamarind, the sycamore fig, and various acacias.

Altitude plays an insignificant part in the distribution of the forests. The principal trees of the jebels or hills are gum-resin-yielding trees and bamboos.

In the Gezira the wet season, preceded by heavy thunderstorms, usually sets in during May or June, though sometimes the first rains occur in April, and continue fitfully up to the beginning or middle of October, rain falling at irregular intervals, and gradually converting the heavy and tenacious soil into a quagmire impassable for horses and animal transport and very difficult for pedestrians. On the east bank of the Blue Nile the rainfall is rather heavier and more regular. In the fertile districts adjacent to the upper course of the Atbara the periodical rains can practically be depended upon from June to the middle of September.

From Shendi, between lat.  $16^{\circ}$  and  $17^{\circ}$  N., to the frontier the rainfall is light. Light summer rains—July to September—fall on western slopes of Red Sea Hills. On Red Sea coast light winter rains—November to January—may occur.

Rain occurs at Khartoum (average 15 days' rainfall) from the middle of June to the last days of September; it lasts in the Bahr el-Ghazal from April to October; in Darfur and southern Kordofan from June to October; in the basin of the Sobat from May to October.

The increasing rainfall towards the south renders cultivation without artificial irrigation possible in many places.

Heat and dry winds, however, accelerate evaporation, while the rain mostly comes in deluges which run off the ground without penetrating it. Excessive rains produce conditions unfavourable to cultivation and to stock. The privations and labours of an excessively rainy period are very great. Incessant and laborious weeding is necessary to preserve the young crops. Various diseases produced by the unhealthy conditions are great hindrances to sustained labour.

The following is a list of the chief articles of produce, with the districts where they are mostly found :

Cotton : throughout the Sudan in small quantities, but mainly at Tokar, Kassala, the Gezira, and in Berber and Khartoum Provinces.

Hides : Kordofan, White Nile, Upper Nile, and Eastern Sudan.

Gum : Kordofan, Darfur, Blue Nile, White Nile, and Gedaref district.

Ivory : Bahr el-Ghazal and Upper Nile.

India-rubber : Bahr el-Ghazal.

Feathers : Kordofan and Darfur.

Woods : up the White and Blue Niles and in Bahr el-Ghazal and Mongalla.

Cereals : chiefly the Gezira, Sennar, Dongola, Berber, Gedaref, and Upper Nile.

Dates : Dongola, Halfa, and Berber.

Gold : Northern Sudan and Upper Blue Nile.

Copper : Hofrat el-Nahas (Bahr el-Ghazal).

Iron : Bahr el-Ghazal and Kordofan.

Salt : Northern Sudan and Red Sea coast.

Other minerals : Kordofan, Upper Blue Nile, and Abyssinian border, Eastern and Northern Sudan, Mongalla.

Mother-of-pearl : Red Sea coast.

Oil Seeds : Kordofan. Kassala, Sennar.

Cattle : Kordofan, Kassala, White Nile, Upper Nile, and southern districts.

Sheep : Central and western districts.

Vegetable Ivory : Berber and Kassala.

Senna Mecca : Berber, Khartoum, Dongola.

Butter (*Ghee*) : Red Sea, Kassala, and Kordofan.

### *Northern Sudan*

Halfa and Dongola Provinces contain vast wastes and steppes almost without vegetation or water, but in these provinces and Berber on the shores of the Nile the soil is formed of rich sedimentations, which, given sufficient irrigation, are suitable for cultivation. The water of the annual Nile flood is utilized by numbers of sakias and shadufs, and by pumps. As the rainfall here is inadequate, cultivation usually ends some 650–1,500 ft. from the river, reaching only here and there to a depth of 3 miles. Dura, maize, barley, wheat, peas, beans, senna, sesame, and cotton are grown. The cereals grown exceed, in good places, local requirements. Along the Nile are date palms in considerable numbers ; the dates are of excellent quality and ripen in October or November. They are largely exported ; the soft varieties compare favourably with the Egyptian and Persian dates. In Halfa and Dongola dates form an important source of revenue. Dom palms (*Hyphaene thebaica*) and some tamarinds are also found, along with mimosas and acacias, the wood of the last-named being used in making sakias. A good deal of senna is collected by the Arabs ; it is also cultivated. Vine culture is successfully carried on in Dongola on a very small scale.

Communications in Dongola are relatively good, viz. Nile navigation and the railway between Kareima and Abu Hamed. As cultivators the population has still much to learn, and the product of the province is small. The greater part of the land under sakia cultivation can be made to yield two or three crops annually. Cotton is grown on a very small scale in Dongola, rather more extensively in Berber.

West of the river, between Halfa and Kerma, the desert

reaches the river bank, and a sparse vegetation is found only in spots where some rain falls or a little water collects. Even the few oases are uninhabited and are only visited by wandering Hawawir or Kababish Arabs seeking for natron or wild dates, or by Bedaiat Arabs, who live north of Darfur and bring their camels here.

The so-called Atbai or Nubian desert between the Nile and the Red Sea, and inhabited by nomadic Bisharin and Amarar, although as yet little explored, scarcely merits the name desert without qualification. There are a number of hills in which streams rise, and, after good rains, the beds of wadis are sown with dura, dukhn, melons, &c. In the deeper-lying places, however, animals can find nourishment all the year round. The great stream of the eastern Atbai, the Di-ib (Odib), forms a wide basin one mile broad and 8-10 miles long, which retains a rich alluvial deposit after the disappearance of the water, and here the Arabs annually cultivate dura, obtaining good results. That this country was once, to a certain extent at any rate, rich in gold, is evident from the numerous shafts and traces of former workings.

Berber Province contains large cultivable areas, not only along the river banks, but inland, mainly east of the railway, but cultivation is limited by the meagre rainfall. In good years the output of cereals exceeds the requirements of the population of the province. Cotton is grown in increasing quantities. Sakias and shadufs are numerous, and at various places, notably at Zeidab, where larger areas of riverain land are available, pumping stations are established. Basin cultivation is also carried on at Wad Hamid in the south of the province. Beans and other vegetable produce are grown in small quantities, while the Atbara dom palm forests yield vegetable ivory, and useful timber much used by natives for houses and sakias. Date palms are numerous. Senna, henbane, and colocynth are collected. Flocks and herds and camels are plentiful. Communications are excellent, as the main railway route from Khartoum to Halfa

and Port Sudan runs through the province, parallel to the river, which is navigable throughout, except at the cataract near Atbara. Desert tracks lead to Kassala and Suakin.

In Red Sea Province the plain of Tokar is almost entirely devoted to the cultivation of cotton for which its fertile soil and climatic conditions are favourable. There is a slight and erratic winter rainfall (averaging 6 inches) from November to January. The rich ground fertilized by the silt of the Khor Baraka is admirable for cotton and other cultivation, but the unequal, sometimes violent, sometimes insufficient, flood of this Khor causes considerable variation in the area cultivated. The settled population is small and nomadism relatively high. There is a large influx of population in the cotton season.

The main crop is cotton, and a certain amount of dura and dukhn is grown.

Suakin town has always been the centre of a considerable trade. Since the construction of Port Sudan and the railway to Berber, Suakin has lost much of its importance, especially as a port, but it still has a flourishing trade with the interior, principally with Kassala, and is closely connected with the development of cotton cultivation at Tokar. The railway has now supplanted the desert route from Berber to Suakin. Berber town was a place of considerable traffic in former times, being the place where caravans from the Red Sea and Egypt via Korosko discharged their goods for transfer to the river, from 30,000 to 40,000 camels passing through annually. Berber is still a large native centre.

The country enclosed by the river and the main line of railway between Halfa and Abu Hamed is waterless, sandy or gravelly desert, broken here and there by rocky hills and ridges. Practically uninhabited, it is believed to contain minerals, and workings of old mines are being examined.



*Central Sudan*

The central eastern Sudan has a heavier rainfall than the northern zone. It is especially fortunate in water-courses, having the Blue and White Niles, also the Atbara and the Gash, and is much more fertile and cultivated than the western central Sudan.

To the north of Kassala, to the river Atbara on the west, and on the east to the hills along which the frontier is delimited, stretches an almost unbroken plain. From Goz Regeb, a point on the river west of Kassala, the country inland consists of a broad strip of cotton soil, sparsely sprinkled with small trees and bushes, until the fertile soil adjoining the Khor el-Gash is reached.

Kassala possesses in the Gash a most important economic asset. The Gash delta is said to comprise upwards of 250,000 feddans of cultivable land, and, in fact the area of cultivable land is limited only by the water available for flooding.

The inhabitants of the town of Kassala, mainly Arabs, are reputed to be fair cultivators. Their dura, called Taulib, ranks in quality with the best Mugad Nile dura. It ripens towards the end of December. Swarms of small birds and locusts do much damage to the crops, which also suffer from another pest, *el-asal* (*Aphis sorghi*).

Trees and luxuriant grasses indicate the great fertility north of the town; but the population of the province is small and the banks of the Atbara and its tributaries are largely uninhabited. In the upper reaches the banks of the river become a marsh during the rains, and afterwards tall grasses make the district impassable. Life awakens here during the dry weather, when thousands of oxen and sheep seek pasture. On the Setit are the Hamran Arabs, with some repute as hunters, but not as cultivators. The banks of the Bahr el-Salam, the Angareb, the Atbara, and the Setit, all present obstacles to cultivation. There are thick growths of thorn and scrub, and great labour is neces-

sary to remove the grass and render the land fit for cultivation.

A rough guess puts the fertile area of the Atbara alone at fully 15,000 square miles, in which cotton, millet, rice, and tobacco could be successfully grown. The soil of the plain which extends from Goz Regeb to Kassala is said to be very rich. Tropical cereals grow to perfection in Kassala, dura often attaining a height of 10 ft. Altogether the latent agricultural possibilities of this region appear to be considerable.

South of the Gash a flat, and except for the Gash itself, waterless plain extends to the river Setit. South of the Setit honey and gum are practically the only products of the country, although a good deal of game still exists.

The vast tract of country from the junction of the Atbara with the Nile southwards to about the line Abu Haraz-Sofi is still sometimes called the 'Island of Meroe', but this name is now unknown to the Arabs. The northern or El-Daheira district of this region is, as its name denotes, a sandstone plateau, bare and desert-like. On the west are considerable ranges of sandstone hills. Its soil is as a rule poor and unfertile, except in the wadis, a few of which are usually cultivated by the Arabs in favourable years. Farther south there is much more land suitable for cultivation, but even here it is generally seen in the wadis only, although the rainfall is markedly heavier. Seleim, samr, sayal, and tundub trees grow plentifully. In the El-Karata and Sharg el-Adeik districts wells are comparatively numerous, but deep and rather salt. In El-Karaba saltworks are frequently seen. The Arabs own large numbers of sheep and goats, but cattle and camels are comparatively scarce.

The Blue and White Niles surround the peculiarly productive district of the Gezira, and circumscribe the greater extent of the important province of Sennar. These form together the richest and most densely populated region of the Sudan. Sennar reaches from south of the Gezira to Fazogli on the Abyssinian frontier on the west, and nearly to the Sobat on the south. An estimate, probably favourable,

puts the cultivable area of the Gezira and Sennar at the immense figures of from eight to fifteen million acres. It is certainly very great.

Near Khartoum the ground is covered with a surface layer of drift sand. The soil of the Gezira is stiffish with a high percentage of clay, lighter in colour towards the north, getting darker as one goes south. The plain permits easy irrigation on a large scale, and under it the more lightly coloured soil is just as fertile as the darker soil to the south, though the heavier rains of the south with the growth of rank grass give the impression of a richer soil. Singa, some 300 miles from Khartoum, is surrounded by typical black cotton soil often heavily cracked. In this area a great deal of dura and sesame is grown under the heavier rainfall. Karkoj, 24 miles south of Singa, was once famous for its extensive trade with Abyssinia in gum, cotton, tamarinds, and hides. The Wad Medani and central districts are the most thickly populated and most cultivated.

There is a sedentary population on the banks of both Niles. There are only patches of riverain cultivation, with the exception of the Tayiba and Barakat estates which are artificially irrigated. On these estates over 4,000 acres of long staple cotton are grown annually.

From Sennar the villages and settlements stretch to the White Nile and in years of good rainfall the dura fields extend for miles in an unbroken line.

Towards the south cultivation and population diminish. The interior of this district, even in the north, is inhabited by semi-nomads, who pasture flocks or grow dura there during the rainy season. In the dry season they move south or seek water and pasture on the river banks.

The lack of population in the south is easily explained by the period of drought followed by the marshy impassable ground of the rainy period. The thorn bush grows more thickly, and there are forests of tall tamarinds, sycamores, euphorbias, and many sorts of acacias. The forests are interrupted by extensive marshes which in the dry season

form excellent pastures. The grass reaches a height of 8-10 ft. The natives prepare their pastures by burning the dry grass.

In Sennar and Blue Nile Provinces a small amount of cotton is grown by natives both on the river bank and as a rain crop in depressions inland. Sesame is grown as a rain crop in Sennar in quantities large enough to allow exportation. Wheat is grown in very small quantities; the cultivation of maize along the river is increasing in Sennar. The principal product of the Gezira, however, remains *dura*, among which the kind known as *Feterita* is chiefly grown.

The country opposite Singa is the most promising region on the eastern side of the Blue Nile, watered by the Dinder and the Rahad, and stretching to the Abyssinian mountains in one vast, unbroken plain of rich land. In pre-Mahdi times there was a considerable population in the Rahad and Dinder districts, but it was practically exterminated under the Mahdi and Khalifa. The country for the first 18 miles across to the Dinder, and for a distance of 6 miles beyond it, is covered with dense, thick bush, upon which succeeds perfectly flat, open country, overgrown with grass 9-10 ft. high. The soil is of the same description as on the west bank, generally black, often without a vestige of stones or pebbles for miles, and reaching in places to a depth of fully 75 ft. This is interspersed with patches of red, ferruginous soil. The tract between the Dinder and the Rahad is flooded to some considerable extent during the rains. Shoals, rocks, and overhanging trees, and their tortuous courses, make the Rahad and the Dinder difficult of navigation, but tugs and barges ascend the Rahad during the flood.

In the lower Beni Shangul country, cut off from the Gezira plain by the Keili mountains, there exists on both sides of the river Tumat, between Bakori and Amora, a practically uninhabited country with alluvial flats estimated at fully 720 square miles in area. The Tumat flows into the Blue Nile about 40 miles south of Roseires, and when in flood is only

3 ft. below the level of its banks, so that the facilities for irrigation are good. The rainfall is copious, the rainy season lasting fully six months. Very favourable accounts are given of this region, the cultivated lands being said to possess a very rich soil.

Here and there on the Dinder the inundated flood bank is sown during the rainy period, and some cotton is grown in this way. The sowing takes place in July, the first pickings (there are usually three) four months later. The last picking gives the poorest result. In good years an acre yields up to 1,000 pounds of unginned cotton. Its fibre is not so fine as that of cotton raised by skilful irrigation. A native variety known as Mumtaz is grown, but better types are being gradually introduced. Some sesame is grown along the Rahad.

Apart from the streams, rich lands and a heavy rainfall open many food sources to the east of the Blue Nile. The great El-Butana plain is open and flat, not a tree or shrub being visible as a rule for miles, except along an occasional wadi. The grasses called Hantut grow in the rainy season and, together with the Siha plant, attract camel-breeders hither from various parts of the Sudan. The district in which are Gedaref, Gallabat, and Mafaza has good possibilities of cultivation owing to its relatively copious and regular annual rainfall, but the development of this district and that of Kassala Province generally is seriously hampered by lack of rail transport. Dura and sesame give good yields, and cotton grown at Gallabat is exported to Abyssinia. Gedaref has a peculiar kind of dura called Kurgi, the meal of which is very white. In the neighbourhood of Gallabat there is, what is rare in the Sudan, one brook containing water all the year round. The inhabitants are largely Takruris, an industrious negro race from West Africa. The method of burning after the first rains is common. The first rains germinate the grass seed lying in the ground and when the old grass is fired the young grass is scorched and killed, thereby saving weeding and cleaning in the cultivation of the crop.

The sowing takes place on the ground thus cleared and fertilized by the ash. Besides dura and millet, cotton is grown in this way.

In the north of Sennar there is a mixture of Arabs, and negroes. The south remains the domain of the native negro races, who are on a low stage of culture with curious practices, and their methods of cultivation and cattle-raising are equally primitive. The Dinka handle cattle, which are their standard of wealth, with considerable skill. The ox, as generally in the Sudan, is of the humped species (zebu, *Bos indicus*). The sheep of the southern Sudan is a distinct type, with long pendant ears, and hair instead of wool, more like a goat than a sheep. During the dry season the Dinka drive their herds on to the extensive pastures which the marshes then offer. When the rainy season begins most of them desert the bank and retire 20 or 30 miles inland, where they cultivate dura, generally only growing enough for their own needs. The grain is stored in the cultivation villages and only brought to the river in the dry season in small quantities.

Coming to the countries to the west of the Nile, Kordofan, which had been practically ruined by the Mahdi, has been reviving since his suppression. It is an extensive plain of some 96,000 square miles, broken by groups of hills seldom more than 600–800 ft. high. There are numerous water-courses in the north of this plain; in the centre they are less frequent, and there follows an area in which the water trickles away without finding any collecting channels. The wadis are distinguished by their good vegetation, which may, however, in years of insufficient rain not be adequate even to the needs of the camels, while the springs may dry up. There is a rich growth of grass on the red sandy soil of the north in the rainy season, and, when there is sufficient rain, good crops of millet are grown. On the banks of the White Nile there is in many places a rich, black earth. Here the grass and bushes are thick and high. The prevailing tree is the mimosa.

South of lat. 13° N. there is more rain and deep water-courses with steep banks. In the wooded neighbourhood south of the Nuba mountains the forest is the home of all sorts of wild animals, giraffes, antelopes, apes, and elephants, while there are numerous snakes. On the Nuba hills thorny bushes grow between the rocks, except on a few of the more isolated hills, whose summits consist of piled masses of rock devoid of vegetation. They are terraced for cultivation to 300–400 ft. from their base, and large crops of dura are raised.

There are Arabs in the plains, Nuba in the mountains. The Arabs are either sedentary cultivators or nomadic herdsmen, in the north camel owners, in the south cattle and horse owners. The sedentary Arabs cultivate rainland or on the beds or deltas of rain wadis, growing dura, beans, onions, millet, and some cotton. They have small herds of sheep and goats, with some asses and oxen, and a few camels.

Before the beginning of the rainy season in May the ground is cleared of the grass and the seed is sown after the first good rainfall. The harvest is in the end of October or early November. Dura and dukhn are the principal food grains of these districts. The Arabs eat dura in flat cakes (Kisra), or cooked (Asida), and also prepare a stimulating drink from it called Merissa or Um Bilbil. In the better-watered regions south of El-Obeid dura takes the place of dukhn. Sesame, grown in large quantities everywhere, is exported to the north and also pressed on the spot for oil in primitive mills constructed from the stem of an acacia; an arm attached to the pounder is moved round by a camel or an ox. The oil is used in cooking or for the hair. Tobacco and cotton are grown in very small quantities in many parts.

The Nuba have yearly rich harvests and possess many herds, mainly of sheep and goats. They cultivate principally dura in the extremely fertile plains near their hills.

Regular cultivation is impossible without an adequate

water supply. In districts where the springs dry up after the rains there are often artificial ponds formed by the damming of a small brook, but these rarely furnish water after the end of October. The natives of West Kordofan make use of the Tebeldi tree (*Adansonia digitata*) as a reservoir for drinking water. A good tree of this kind is a valuable possession. Small, almost tasteless, melons are also an important source of moisture, and on them whole villages have often largely to depend during the dry season; the rinds are given to the goats.

The district occupied by the Shilluk along the western bank of the Nile between Kaka and Lake No is almost entirely grass land, and cattle-raising is their chief occupation. Their oxen are strong and well-built, but the sheep and goats are small and poor. Among the cows a notable percentage are barren, and a good milch-cow is a valuable possession. Although the black soil along the river is rich and deep, cultivation has not been greatly developed. The young Shilluk begins to cultivate a small field when about fourteen years old in order to have, when a man, the means to purchase a wife. Maize, beans, a very little cotton, earth-nuts, sesame, melons are cultivated. The product is not always enough for local consumption, and famine sometimes ensues.

Kordofan has always been famous for its gum, much of which is obtained in the east of this region from the *Acacia verek* (hashab). Gum trees are not cultivated, but there are extensive blocks of trees, so-called 'gardens,' geneinas, where the trees are more or less carefully tapped for gum, which fetches more than that collected indiscriminately. The extensive woods of red gums in the south have not been considered worth exploiting.

Iron is plentiful, but now seldom worked. The gold is probably worked out (see 'Mineral Deposits', p. 405).

The north and north-east of Darfur to the hills in the centre resemble the rather waterless parts of Kordofan, but the remaining part of Darfur is better provided with water and more fruitful. Corresponding with this, the north and north-



east are the domain of nomadic, camel-breeding Arabs. In the east in restricted areas dukhn and some dura are grown. In a few depressions are found sesame, gherkins, pumpkins, water-melons, and a little cotton and tobacco are grown for local consumption.

In the west cultivation increases, the richest and most cultivated part of the land being the hilly middle. The rich meadows on the hill slopes give good pasture to the cattle of the sedentary population, and on the hills are terrace gardens of vegetables, and extensive flats of barley, wheat, dukhn, dura, sesame, and cotton. Even in the rainless season onions and water-melons are found in the dry water-courses.

In the east the sandy soil contains a quantity of iron, which is worked to some extent. Sand rich in iron is met with in the depressions of the Jebel Marra group.

The majority of the inhabitants are Fur, who are fanatical Mohammedans, and on a relatively high level of culture, but said to be given to drunkenness and theft. The Arabs of the south of Darfur are Baqqara. Darfur has altogether a considerable sedentary population. Corn and merissa are the main articles of consumption.

The Baqqara Arabs raise horses, small, ill-looking animals, which are, however, very enduring, and able to go sixty hours without water. Camel breeding is the principal pursuit of the Arabs in the north and east of Darfur. These Arabs occupy themselves entirely with this industry, and buy even the corn which they consume. Camels form the best transport animals in Darfur, except in the mountains and in the south, where mules, donkeys, or bullocks are preferable.

In the south the sedentary inhabitants possess cattle and sheep in abundance. The cattle are either the humped species or the so-called African variety with long horns. The former are compact, well-made animals, and become very fat, the others are of poorer quality. The sheep have but little wool, but their flesh is good; there is one species with long curly hair. Goats abound everywhere.

*Southern Sudan*

The southern provinces, the Upper Nile, Mongalla and the Bahr el-Ghazal, are, in respect of the potential productivity of the ground, considered by some authorities among the most promising of the whole Sudan. They have abundant rain, many water-courses, a rich soil, and tropical vegetation, but numerous marshes and great stretches of land which are annually inundated.

Sir Samuel Baker considered that the Upper Nile area 'might produce enormous wealth in the cultivation of cotton and corn', and other authorities regard these districts as a country of splendid fertility capable of great development, being favoured with a good soil and possibilities of satisfactory irrigation.

For the whole 212 miles, from the junction of the Baro and Pibor to its mouth, the Sobat flows through an immense alluvial plain varied with extensive woods which come down to the water's edge. The country is often park-like with scattered trees or else flat plains of grass, vast savannahs with excellent pasture, on which are all sorts of wild animals, elephants, giraffes, ostriches, antelopes. On the river are numerous waterfowl. The banks of the Sobat are flat and low, here and there expanding to a swamp. The black alluvial soil is said to be of a uniformly high quality, and to extend 100 miles on the left and 30 miles on the right bank. It has been said that from the south bank of the Sobat, stretching along the White Nile to beyond the Bahr el-Zeraf, there is a cultivable area of perhaps 10,000 square miles.

The country above the Baro and Pibor is one vast grassy expanse, which becomes a huge swamp when the rivers are full, the grass attaining 12-15 ft. The soil appears to consist of a rich black to brown clay, interspersed with red ferruginous stretches. Most of this country to the frontier is practically unknown. It is arid and waterless for con-

siderable stretches. In the south the forest is perhaps finer and more generally distributed than farther north.

South of the junction of the Ajibur and Akobo an undulating country leads to the foot of the Boma hills. The soil is generally of a gravelly nature ; the district is often wooded ; it is almost uninhabited. In the hilly district of Boma are many streams, villages, and slopes. The soil is apparently very fertile and suitable for the cultivation of all kinds of cereals. Wild figs grow abundantly along the banks of some of the streams. The loftier heights are well wooded and would probably provide excellent timber for building purposes.

Among the people of the Upper Nile Province the Annuak or Yambo are industrious cultivators. They occupy a fruitful plain through which the Baro flows, having its banks cultivated to a depth of one mile inland. Two crops are raised. Otherwise there is not much cultivation in the Upper Nile province. The Annuak have many goats and sheep. The real difficulty is lack of population. The Nuer is the most numerous race. They cultivate enough grain to enable them to live for six months in the year, nourishing themselves for the rest of the time principally on fish, of which they can procure great quantities. They and the Dinka have great herds. They also grow tobacco of good quality. From Bor to Mongalla are the Beir, who grow some dura, tobacco, and earth-nuts. The Karuno, on the banks of the Karuno, are better cultivators than the Beir.

The Bahr el-Ghazal Province extends to the west beyond the swamp regions of the White Nile that close in the southern regions of the Upper Nile Province. It is a vast region of forests and alluvial plains, and has abundance of cattle. It possesses both iron and copper. The chief product is ivory ; rubber also exists and a little is exported. The remoteness and inaccessibility of this province explain why its natural wealth and agricultural capabilities have been so little exploited. The more enthusiastic observers of this region believe that it could yield abundantly the chief tropical

cereals, oil seeds, sugar cane, tobacco, rubber, cotton, resins, butter, bananas, tamarinds, bees-wax. Lupton Bey said it was 'the richest province in the Sudan', and Emin Pasha considered it favoured 'above all others from every point of view'. The Yei district of Mongalla province also has considerable agricultural possibilities.

As yet cultivation has done very little to justify these favourable opinions. In the northern part of the Bahr el-Ghazal the country is flat, the soil clay, with great plains of long grass and many swamps. To the south and west the country rises to a tolerably high plateau. Crystalline stone breaks through the black, clayey soil, which is fertile not only in the deeper-lying places, but even where it is mingled with sand. The richest alluvial soils are on the river banks. Great forests cover the country almost from east to west. In the steppes of the lower level are many grassy plains, which become vast swamps in the rains. The soil both in the swamps and in the land liable to annual inundation is a rich, black, clayey loam. It is only in the upper reaches of the rivers that the alluvial deposits almost disappear and the rocky tree-clad slopes descend abruptly to the river. On the high plateau maize, dura, sesame, millet, and various vegetables are grown, but only in a small way. The ground is prepared in April and the seed sown in May. The harvest follows in November or December, only one being got annually. Ground-nuts and pumpkins are also grown, especially by the Dinka. Sesame, telabun, dukhn, and various vegetables are grown here and there. The Nyam Nyam are one of the most progressive of the negroid race, and their husbandry is good. They grow large quantities of dura, bananas, lemons, tomatoes, sweet potatoes, sugar cane, manioc, and onions. They do not raise cattle to any great extent.

There is a great deal of ivory, and elephants are still numerous, especially towards the north.

As regards india rubber; among the rubber-yielding species is a fairly large apocynaceous creeper, a *Landolphia*. Of three similar plants one is an apocynaceous climber (also

a *Landolphia*), another is a large ficus, while a third is a *Bassia* (*B. Parkii*) and the only one belonging to the natural order of the Sapotaceae, which yields the best gutta percha. *Landolphia owariensis* is fairly well distributed over much of the province.

With exceptions the forests have suffered from fire, the trees are stunted, crooked, hollow, or generally misshapen. There are, however, a few gigantic trees which would yield timber of large dimensions. There is also bamboo, and plants, like the *Sansevieria guineensis*, which yield strong and durable fibres. The best forests are those between Deim Zubeir and the Bongo.

(For the important mineral deposits of this region see p. 405.)

### THE NILE RÉGIME

There are three principal and characteristic factors which exercise a marked effect upon the Nile as a whole, and influence to a greater or less degree each portion of the river system : (1) the rainfall of the plateau of the equatorial lakes and the Abyssinian plateau—both of these areas receive a heavy rainfall and supply the whole of the water which is carried by the Nile and its tributaries, the amount of rain which falls on the Sudan plain being so small that its contribution to the river is negligible ; (2) the rainless, or at least arid, conditions which prevail over a very large proportion of the basin ; (3) the very low slope of the basin, which is such that an altitude of 1,500 ft. above sea-level is not reached on the White Nile until a point 3,000 miles from the Mediterranean, near Gondokoro.

Both the Victoria Nile and the Semliki Rivers descend very rapidly from the equatorial plateau in several series of rapids, interrupted by level reaches until Gondokoro. Then follows a length of 1,060 miles in which the river falls only 180 ft., or at the average rate of only 2 ins. per mile. The slope increases again beyond this point, and the river descends some 800 ft.

(244 metres) in 1,200 miles in passing the several cataracts between Khartoum and Aswan.

The drainage system is very incompletely developed on the equatorial plateau ; lakes, marshes, and river-reaches of low slope, choked with reeds and water plants, alternate with rapids and rocky stream-beds, down which the river rushes to deposit its load of detritus in another lake or plain tract lower down.

The Sobat, the Blue Nile, and the Atbara all rise on the Abyssinian plateau at altitudes of from 6,000 to 8,000 ft. (1,830 to 2,440 metres), and pour down deep-cut gorges until they reach the plains of the Sudan, where they have excavated meandering channels in the alluvial plain.

The quantity of water supplied by these two great gathering grounds would be very large but for the geographical conditions which reduce that from the equatorial plateau to an almost constant supply estimated to be about 12,000 or 14,000 cubic feet (340 and 400 cubic metres), while the Abyssinian rivers, on the other hand, may furnish about 500,000 cubic feet (14,000 cubic metres) per second in a high flood.

In the majority of rivers the volume of water which they discharge increases from a very small amount near their sources to a maximum near the point where they empty themselves into the sea or an inland lake. With the Nile it is quiet otherwise ; not only has it a very marked seasonal change of volume, but from point to point of its course its volume varies greatly, as local conditions affect it. The maximum is reached where the Atbara joins the Nile, and from this point onwards the volume diminishes owing to evaporation, seepage, and abstraction for agricultural purposes.

The supply is furnished : (1) by a belt of rainfall which oscillates during the year from about 15° south of the equator to 15° north of it. In January British Central Africa receives its heaviest rainfall ; in Uganda the spring maximum occurs in April and May. (2) By a monsoonal rainfall on the Abyssinian plateau during July and August, when 60 per cent. of the year's rain falls. In autumn the rain-belt travels southwards,

again passing the equator about November and reaching its southern limit in January. Thus the equatorial plateau has two rainy seasons and two dry seasons, while the Abyssinian plateau and the Sudan plains have a single rainy season in the summer months. North of Berber practically no rain falls.

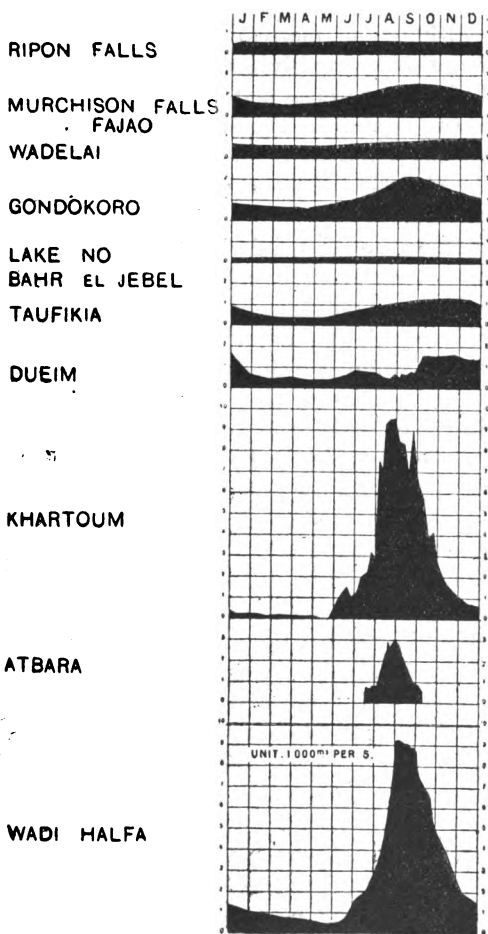
The following table gives the areas of the catchment basins :

<i>Name of Basin.</i>	<i>Area.</i>	
	<i>Sq. kilometres.</i>	<i>Sq. miles.</i>
Victoria Lake . . . . .	238,900	92,243
West valley (including the basins of Albert Edward and Albert Lakes and the Semliki River) . . . . .	54,100	20,889
Victoria Nile . . . . .	75,600	29,190
Bahr el-Jebel (including the Bahr el-Zeraf) . . . . .	190,700	73,632
Bahr el-Ghazal . . . . .	552,100	213,175
Sobat . . . . .	244,900	94,560
White Nile . . . . .	353,550	136,492
Blue Nile . . . . .	331,500	127,998
Atbara . . . . .	220,700	85,216
Nile . . . . .	605,600	233,832
Total . . . . .	2,867,650	1,107,227

The supply effectively furnished to the river at different points by the rainfall is shown on the accompanying figure, where each division of the vertical scale represents a discharge of 35,300 cubic feet (1,000 cubic metres) per second. The flood represented is that of the year 1903, and was in volume 11 per cent. below an average flood at Aswan.

The diagram shows that, while the change of level of the Victoria lake makes but little difference to the discharge, a very marked seasonal variation occurs at the Murchison Falls, where the low-stage volume is about 21,000 cubic feet (600 cubic metres) per second, compared with 56,000 cubic feet (1,600 cubic metres) in flood, and this increase is due to the July–November rainfall on the northern edge of the plateau, since above Foweira the water-level of the Victoria Nile varies but little. At Wadelai the level varies with that of the Albert Lake, and the discharge shows a maximum towards the end of the year. At Gondokoro a well-marked maximum in September corresponds to that already noted at the Murchison Falls, and, like it, is due to the rainfall on the northern edge of the

# VOLUME DISCHARGED BY THE NILE.





plateau. But little of this water ever reaches the White Nile, for as the level of the Bahr el-Jebel rises the plains of the valley are flooded, and the discharge into Lake No, 500 miles to the north, hardly varies throughout the year. This 12,000 cubic feet (340 cubic metres) per second represents the whole of the effective supply furnished to the White Nile by the rainfall of the equatorial plateau, approximately one-tenth per cent. of the rainfall.<sup>1</sup> The Bahr el-Ghazal and the Bahr el-Zeraf together contribute one-third of what is furnished by the Bahr el-Jebel, and the combined discharge of these three rivers represents the whole of the supply which is not derived from the Abyssinian plateau.

In the Sobat River we have the effect of the Abyssinian rains, but the maximum is only reached in December, owing to the delaying effect of the plains of the Pibor River, which are flooded by the summer rains, and are only drained off gradually.

The White Nile carries the volume supplied by the Bahr el-Jebel, Bahr el-Zeraf, and Bahr el-Ghazal, together with whatever is supplied by the Sobat—that is to say, from about 14,000 cubic feet (500 cubic metres) per second as a minimum to about three times that amount in flood-time. But the slope of this portion of the Nile is so low that the flood-water of the Blue Nile ponds back that of the White Nile, and while the Blue Nile is rising rapidly but little of the White Nile water passes forward; it floods its own valley, forming a reserve supply, which drains off in November and December when the level of the Blue Nile has fallen. Thus the equatorial plateau has practically no effect on the flood in the Nile valley north of Khartoum, but furnishes the bulk of the low-stage supply.

From Khartoum northwards the discharge diagram takes a wholly different form, for the Blue Nile is fed by the rains of Abyssinia, which may be considered as almost restricted to the months of June, July, August, and September, in which three quarters of the year's rainfall occurs. Consequently the

<sup>1</sup> Recent calculation 14,000 c. ft. = 400 c.m.

river rises rapidly to its maximum level, which it reaches at the beginning of September, and then falls almost as rapidly. The Atbara is supplied by the same rains, and has a similar régime, but falls somewhat earlier, so that the maximum level at Wadi Halfa and Aswan is also reached in an average year at the beginning of September.

The Wadi Halfa diagram shows the resultant effect of the two sources of supply—the Blue and White Niles. At the beginning of the year the discharge of the Blue Nile has diminished to a very small amount ; the Sobat is furnishing a considerable quantity to supplement the constant volume delivered by the Bahr el-Jebel, and to increase the water which has been stored in the White Nile valley, and which is now rapidly running off. From this time until May the volume of the Blue Nile and that of the Sobat both decrease rapidly ; the water stored in the White Nile has drained off by the end of January, and all that is available for Nubia and Egypt is the water from the equatorial plateau supplemented by such small amount as the Sobat and the Blue Nile may still bring down, and by a certain quantity which drains back into the river from the flood plains and the sandstone which forms the valley sides. This, then, is the time of Egypt's greatest need, and increasing cultivation has necessitated the construction of reservoirs and regulating dams by means of which the surplus water of November and December can be stored up and supplied during the period of deficiency which lasts through May, June, and July. Since the amount of water which arrives from the equatorial plateau is constant throughout the year, it is easy to see what will cause deficiency in the low-stage supply. Weak rains in Abyssinia ending earlier in the autumn than usual will cause the Sobat and the Blue Nile to fall to their minimum early in the spring months ; the low flood will have held up less water in the White Nile valley, so that the variable sources of supply will be much reduced. If such a state of things occurs in successive years the underground water-table of the valley will fall, and this also will act prejudicially. Continuous cultivation of arable land was

impossible until engineering works had been constructed to raise the level of the water sufficiently for it to flow into the perennial supply canals, and until reservoirs existed in which the surplus water of the autumn could be stored for later use.

Engineering works have so altered the conditions of the Nile supply in Egypt that in future the flood will no longer have the same importance as formerly. In full flood there is always more water than can be utilized. It is the low-stage supply (on which the cotton crop depends) that is now most minutely studied. If the flood has been large the springs in Abyssinia provide more water to the Sobat and Blue Nile, and these two variable factors in the low-stage supply supplement the volume of the White Nile; if the rains have been weak, or have ceased earlier than usual, the springs will diminish early, and the Sobat and Blue Nile give but little help in the early months of the year. It is under these conditions, when the flood of the previous summer has been deficient and the low-stage levels are abnormally low, that the rainstorms which occasionally break on the Abyssinian plateau from November to March are of inestimable value. Their importance has hardly been generally recognized, but the meteorological conditions on which these storms depend are now being fully studied. The winter of 1906-7 furnishes an instance of the importance of these winter rains, for after a flood which was 30 per cent. below the average, rain in February and March raised the river level sufficiently to convert what would otherwise have been a very deficient summer supply into one sufficient for all needs.

On the equatorial plateau, where rain falls during the greater part of the year, vegetation grows everywhere luxuriantly; man can with little exertion cultivate what is necessary for subsistence, and the distribution of animal and vegetable life does not depend on the river system as in more arid regions. On leaving the plateau, however, and following the Nile northwards, the protracted rainy season is left behind, and on the plains which stretch away from the foothills rain falls from May to September, while the winter half of the year is almost dry. The annual amount of precipitation, which near the

foothills reaches 50 ins., decreases rapidly northwards ; and at the mouth of the Sobat (lat. 9° 30' N.) it does not exceed 30 ins. A ridge of granite and gneiss of no great height extends in a north-westerly direction from about Wadelai, and streams flow down its northern slope to the marshes which occupy much of the low ground. In the rainy season the plains to the eastward are flooded for miles, and the water is slowly drained off by meandering channels which are half choked by vegetation. Much of the water is removed by evaporation.

The five hundred miles of marsh valley through which the Bahr el-Jebel flows not only absorb the rainfall of 30 to 50 ins. which falls on it, but also the water that flows out of the main stream by numerous branches and side-channels. The dry winds which blow from the plains of the Sudan from November to April also rapidly carry off a vast quantity of moisture ; hence the trebling of the volume discharged at Gondokoro in the rainy season has no effect on the volume which leaves the river to join the White Nile at Lake No. The Bahr el-Jebel, and, indeed, all the rivers of these plains, excavate well-defined, steep-sided channels, but these are not easily recognized, as the rivers flow almost at the same level as their flood plains.

The marshes in the lower reaches of the Bahr el-Ghazal are inundated from June to December, not so much owing to the local rains as to the Sobat flood. The country is here so flat that the rise of 7 or 8 ft. in the Sobat at flood stage raises the water-level up-stream for many miles in the river and the lagoons ; this aids the action of wind storms in uprooting the plants growing in the marshes. Once set free, these masses of vegetation drift into the main river channel, where they may be arrested at a narrow part or at a sharp bend. More masses are constantly arriving, and the block may extend across the channel or in time completely close it. These sudd-blocks occur principally in the last hundred miles of the Bahr el-Jebel ; a few only are being formed near Ghaba Shambe. A rise of water-level in the lagoons is, therefore, an important cause of sudd-blocks, while stormy weather and a narrow meandering river furnish the rest of the necessary conditions.

In the Bahr el-Ghazal marsh region the rivers are for the most part shallower, and the vegetation which blocks them is more often growing on the bed of the stream than drifted into it. But for all this region from Meshra el-Rek to the mouth of the Sobat the flood in the latter river is undoubtedly the important hydrographical factor. Although the rains cease on the Abyssinian plateau after September, the level of the Sobat in its lower reaches slowly rises until the end of November, and only begins to fall towards the end of December. This is due to the water which floods the plains to the south of the Sobat through which the Pibor River flows. Large stretches of country are flooded to a depth of about 2 ft., and slowly drain off into the Sobat as the supply from the plateau diminishes, so that the level in the main river is maintained. The effect of the Sobat flood is felt as far as Meshra el-Rek, for the variation of the water-level of the Bahr el-Ghazal follows that of the Sobat exactly in rising very slowly from June, attaining its maximum level at the beginning of December, and falling rapidly at the end of that month. The effect of this on the discharge at Taufikia is shown in the diagram.

The Sobat, which rises on the southern portion of the Abyssinian plateau at an altitude of some 7,000 ft., descends very rapidly to the low-lying Sudan plains, through which it flows in a well-defined channel. The slope here being slight, most of the suspended material is deposited in the middle reaches, and forms sandbanks which render navigation difficult at the low stage. The Sobat is characterized by the late maximum level which notably augments the volume of water available for Egypt in January and February. In April and May its supply is small, but in favourable years it is a valuable addition to the White Nile.

The country of the Bahr el-Jebel and the Lower Sobat is a vast plain having a very slight inclination. The flattest portion of the Nile valley is that between the mouth of the Sobat and Khartoum. Here the river, at low stage, falls only 36 ft. in a distance of 500 miles, or 1 in 75,000, equivalent to little more than half an inch a mile; at high stage, when the Blue Nile

has risen 26 ft., the water of the White Nile is held up, so that the water-slope from Taufikia to Khartoum is only 29 ft. in the same distance, or 1 in 105,000, which corresponds to about three-fifths of an inch per mile. This fall is chiefly in the southern portion, for, from Hellet Abbas to Khartoum, about 300 miles, the river has a slope of only 1 in 600,000, and this portion of the valley is a vast reservoir held up by the flood-water of the Blue Nile.

The river here flows through an immense plain, with the low hills of Kordofan on the west, and those of the centre of the Gezira, which divide it from the basin of the Blue Nile, on the east. The rainfall rapidly diminishes northwards, and at Khartoum it only amounts to about 4 or 5 ins. annually, all of which falls in the four months June to September. The thorn forest and savannah types of country are now left behind; north of lat. 16° N. even the gum acacia becomes rare and the rainless desert of Northern Africa is reached.

Not only does the rainless region begin immediately north of Khartoum, but the heavy rainfall of Abyssinia furnishes the flood of the Blue Nile, which both supplies the waters of the lower reaches of the river and carries down to them the red-brown silt which forms the flood-plains of Egypt. The volume of the Blue Nile flood is great as compared with that of the White Nile, and only covers four months in the summer. After leaving the hills of Abyssinia the Blue Nile flows in the channel which it has eroded in the alluvial deposits overlying the crystalline rocks of the region, and its banks are of sufficient height to prevent the flooding of the lands which border it. The slope of the river at low stage is about 1 in 3,000 between Fazogli and Roseires, but decreases to 1 in 8,000 below the latter place. The slope between Singa and Khartoum is about 1 in 10,000.

Below Khartoum the river enters the region of the cataracts, which are generally described as being six in number, but this is not strictly accurate, for one portion, which is but a steep and narrow gorge, is included in the sixth cataract, while, on the other hand, the important series of rapids immediately below

Abu Hamed are ignored. At no point is there any considerable vertical fall. Each so-called cataract consists of one or more series of rapids in which the water-slope is from about 1 in 2,000 to 1 in 800.

The part of the Nile basin which includes the valley below the Aswan cataract and the delta does not fall within the scope of this book, but it differs very markedly from the portions of that basin which have been considered. A valley of rich alluvial soil, some 5 to 10 miles wide and 600 miles long, and a delta of the same character, supports an agricultural population numbering on the average 1,100 persons to the square mile.

### THE NILE FLOOD (SUMMARY)

#### *Volume*

The Nile, with a total length of some 3,500 miles, receives no tributary below the Atbara, which enters it nearly 1,700 miles from its mouth, and the amount of rain it receives during its course is negligible. Nevertheless, its annual flood is of such volume as to raise its discharge into the sea from nil in the summer months (when both mouths are entirely closed by earth dams) to 10,000 cubic metres per second at its greatest height, usually about September.

The latest theory of the meteorological causes of the Nile flood is that it is due to the interaction of a weak African monsoon and the much stronger Indian monsoon. As the sun moves north of the Equator, there forms, in April and May, a low-pressure area over the Abyssinian plateau. This low pressure causes an indraught of air from the Indian Ocean. Bringing moisture from the sea this current leads to the April-May rains on the East Africa-Somaliland-Abyssinian Ridge, which will be heavier the deeper the low pressure is and the stronger the resulting current. But, for reasons connected with the rotation of the earth, this indraught on the east coast of Africa is never able to become strongly developed north of the Equator. When, therefore,

the much deeper Indian low pressure of the monsoon develops in June, it overpowers and entirely modifies the Abyssinian low pressure. One result is that a current of moist air sets in from the South Atlantic across Africa. When impinging on the Abyssinian plateau it causes the copious rainfall that gives the Nile flood. As the sun moves south again in autumn, the strength of the Indian monsoon dies down and that of Africa reasserts itself. The south-westerly and westerly current across Africa gives place to a return of the south-easterly winds from the Indian Ocean, and we get the October-November rains in Somaliland, Kenya Colony, and Uganda. The Nile flood is thus good in years of low Indian pressure and poor in years of high pressure. It explains also how the Nile flood is good, in general, when there is a high pressure over the South Atlantic. Heavy rainfall in Africa in spring means that the African monsoon is better developed than usual, a circumstance prejudicial to the Nile flood.

Briefly, the course of the flood in a normal year is as follows :

The White Nile, though furnishing almost all the water during the low stages, only contributes about one-twentieth of the whole volume of the flood, as the greater proportion of the water derived from the great lakes is lost by evaporation from the equatorial swamps. In common with the Bahr el-Zeraf and Bahr el-Ghazal the rains cause its rise to begin about the end of May, though the latter river usually falls again, and does not attain its true flood till July or August. The effects of the first true rise are felt at Halfa about the middle of June. The river continues to rise slowly, attaining its maximum at Halfa about September 3, after which it falls very slowly, reaching its minimum about May 27.

The Blue Nile begins to feel the effect of the rains on the Abyssinian plateau and to rise about the end of May, becoming navigable about the middle of June, and bringing the red fertilizing flood down to Khartoum about June 20, and to Halfa in the middle of July. The rise continues in an irregular manner until it attains its maximum discharge of 9,000 cubic metres per second at Khartoum about September 5, at which



time it is contributing a volume of water and of fertilizing deposit enormously in excess of anything supplied from other sources. Later in September the river falls rapidly. By about the end of December it becomes unnavigable, and it continues to fall until it attains its minimum discharge of 100 cubic metres per second about May 10.

The Atbara, fed by the rains in the Abyssinian Mountains, begins to rise towards the end of May, the flood usually reaching the mouth almost in the form of a tidal wave early in June. It brings down a very large proportion of silt, and attains its maximum discharge of 3,000 cubic metres per second about August 23 at Khashm el-Girba, after which it falls steadily and dries up into a series of pools.

The Sobat normally begins to rise towards the end of April, by reason of the rainfall on the western slopes of the Abyssinian Mountains which are drained by the Baro. The Pibor and its tributaries do not seem to rise till the middle of June, deriving their water chiefly from swamps. The Sobat is usually navigable to Gambeila (on the Baro) by the end of May, though a sudden fall is always liable to occur until the middle of June. It attains its maximum about November 13, and continues navigable until the end of December, when it again falls until its minimum is reached at the end of April.

The flood is partly controlled as regards its distribution in Egypt by the dam at Aswan and the barrages at Esna, Assiut, the apex of the delta, and Zifta.

Navigation is possible at almost all seasons, and without transshipment, from Alexandria to Wadi Halfa, and again from Khartoum to Rejaf.

The average dates of extreme levels from 1907 to 1917 are :

At Khartoum : Highest, September 4. Lowest, May 11.

At Halfa :                   ,,       September 5.                   ,,       June 1.

The average range of the flood at Khartoum for the same period is 5.99 metres (19.65 ft.).

The highest flood recorded at Khartoum since 1868 was during 1869, and had a range of 8.42 metres (27.63 ft.). The

lowest flood recorded was that of 1913, with a range of 4·65 metres (15·26 ft.).

When the Nile floods are examined for a period of about 175 years, during which the records appear to be reliable, no regular alternation of high and low floods is to be found.

Attempts have been made to connect the height of the flood with the various meteorological data, but, although some success has been obtained the forecasts are not sufficiently certain to be of much practical use.

#### *Matter carried in Suspension and Solution*

The White Nile plays only a subordinate part in the flooding of the lower part of the river and little or no suspended matter is furnished by it, but practically all is derived from the Blue Nile and the Atbara. The figure of 1,400 parts per million may probably be taken as the maximum amount of suspended matter carried by the Blue Nile for two or three weeks in top flood ; for the Atbara no estimate can be given. It would appear that of about 2,100 parts per million of material which is carried past Berber as a maximum, some 1,600 parts pass Cairo in years of average flood, a considerable amount being thus deposited in the river bed between these two points in consequence of loss of velocity in the more gentle slopes of the lower reaches.

While the finer silt is deposited in the irrigation basins, on the shelving banks of the river, and on such parts of the flood-plain as are annually flooded, the bottom load is deposited in the bed of the river itself, and consists of the coarser sand which the current cannot carry so readily as the finer material.

The valuable fertilizing ingredients in the mud are phosphoric acid, potash, and nitrogen. The following analyses show the proportion in which these several ingredients occurred in four samples selected for analysis :

	A.	B.	C.	D.
Phosphoric acid . . . .	0·21	0·32	1·78	0·57
Potash . . . .	0·68	0·98	1·82	1·06
Organic matter . . . .	8·00	8·43	15·02	10·37

Nile mud is regarded as supplying sufficient quantities of

phosphoric acid and potash for the growth of fair crops of cotton, wheat, barley, maize, beans, and potatoes, but not sufficient for sugar-cane, berseem, and berseem hagazi (alfalfa), and the amount of nitrogen is believed to be insufficient for nitrogen-consuming crops. The percentage of nitrogen in the suspended matter varies considerably at different times of the year, being highest from May to August, and lowest from September to December. Apart from the nitrogen the organic matter has an agricultural value.

The amount of soluble matter, like the suspended matter, varies very much at different times of the year, being greatest when the river is at its lowest, and gradually decreasing as the river rises, to a minimum when the Nile is at its highest flood level. The quantity varies not only from month to month, but from year to year.

The following is a summary of the result obtained in the Survey Department Laboratory in 1905 :

The maximum was 260 and the minimum 125 milligrams per litre (parts per million). The amount of organic matter in solution is very small ; as measured by the albuminoid ammonia and the oxygen absorbed, it was highest during July and lowest in November ; the amount of nitric acid is also very slight, and was highest in September. None of the soluble constituents are present in sufficient quantity to affect crops appreciably.

The White Nile exhibits the phenomenon known as the green water. The season of lowest Nile is marked by the unusual greenness of the water, which has a putrid taste and smell, which boiling only increases. The green colour is due to large quantities of microscopic algae which are floating in the water, and it is the oil contained in some of these which gives the unpleasant taste and smell. The suggestion that the algae have been forced out of the marshes of the Bahr el-Jebel by the rising flood is usually made, but it seems probable that these minute organisms are brought down throughout the year by the water from the marshes of the Bahr el-Jebel and the Bahr el-Ghazal, but that they do not multiply rapidly in

the White Nile until conditions of hot sun and low velocity of current appear, such as occur in May. After June the rising flood of the Blue Nile is on its way down the river, and, flowing with greater velocity than the green water, overtakes and carries it down before it, thus producing the sudden change from the green water to the muddy red-brown flood.

### IRRIGATION

The Nile, on which the whole economic prosperity of Egypt depends, traverses the Sudan for over 2,000 miles. The deflexion of too much water for the irrigation of the Sudan during the summer months might have a very serious effect on Egypt. On the other hand, in any scheme to improve the irrigation of Egypt the interests of the Sudan must be so safeguarded as to insure to it a proportional share in any prospective benefits. Thus, any question regarding the irrigation of the one country must always be considered in relation to the interests of the other. These interests need not be in serious conflict. The Sudan can most profitably utilize water between July 15 and March 1, when Egypt can best spare it, and consequently makes no restrictions regarding its use by the Sudan.

Irrigation is calculated to counteract to a great extent the capricious operation of the Nile flood and the irregular rainfall. The actual amount of land in the Sudan under direct irrigation is as yet small ; but there are immense possibilities of development. The scanty population will, however, be the ruling factor in development for a long time to come.

#### *Methods of Irrigation*

*Lifting.*—The lifting of water on to the fields is an immemorial native custom. The two primitive instruments of water-lifting, the *sakia* and the *shaduf*, are still everywhere in common use, and wherever there is no alternative method an increase in their number may be taken as a sign of increasing cultivation. The *shaduf* consists of an upright frame on which is pivoted a long pole at a distance of about one-fifth of its length from one end. To the long end is attached a bucket or

skin bag, while at the short end is suspended a counterpoise equal in weight to the bucket filled with water. The shaduf is worked by hand : the bucket is lowered into the water, then lifted by the help of the counterpoise, and its contents tipped over into the channel leading to the cultivated land, where the water is directed by a system of small channels and dams in the required direction. With a single shaduf water can be lifted 8 ft. ; when the bank is high a second or third tier of shadufs—in some places as many as five—are employed before the water reaches the fields. The sakia, or Persian water-wheel, consists of a vertical wheel with a string of buckets attached to it, which, as the wheel turns round, descends into the water, comes up full, and discharges its contents into a channel as it reaches the top. The wheel is turned by means of spokes which catch on a horizontal wheel worked by oxen or other suitable animals. If the lift is high, the string of buckets may be very long ; but, if the wheel itself dips into the water, there may be no string at all, and it is then called a *tabut*. The buckets are often earthenware pitchers, and the wheels are generally of the rudest construction and made of palm wood ; iron water-wheels are also used but are not popular with natives owing to difficulty of repair. Both the sakia and shaduf are uneconomical devices, laborious to use, and now especially so since slave-labour can no longer be commanded. The term ' sakia ' is now in Dongola Province generally used to denote not only the water-wheel itself, but also the plot of land which it irrigates.

*Pumping.*—In 1907–8 the question of replacing sakias and shadufs by pumps run either by government or by private enterprise began to receive attention. The owners of large estates have now their own pumps, and at Zeidab the Sudan Plantation Syndicate, by the aid of a powerful pumping installation, has converted some thousands of acres of waste into good wheat- and cotton-bearing land. Pumps supplying natives with water are also increasing in number and the natives are quick to avail themselves of such facilities. In 1905 pumping was sanctioned over an unlimited area during high Nile, i.e. from July 15 to January 31. As regards low

Nile the area to be irrigated by pumping remained as already fixed, i.e. 10,000 feddans, but water required for experimental farms was granted over and above, while no limitation was fixed as regards the area watered by sakias and shadufs. In 1907 all restrictions as to dates of pumping from the Atbara were removed, except within the limits affected by the backwater of the Nile. In 1912 the maximum area to be irrigated from pumps was increased to 20,000 feddans.

*Basin Irrigation.*—In basin irrigation earthen dykes are run at right angles to the river as far as the desert, a dyke parallel to the river and close to its bank connects them, and so a basin is formed enclosed on the fourth side by the desert slopes. Usually the basins are arranged in a series, one basin draining into its neighbours, and the last of the series discharging back again into the Nile. Sometimes a second dyke, parallel to the river, divides the lower land near the desert from the higher ; sometimes the arrangement is still further complicated by other dykes, making enclosures within the area of the original basin. The object of the basins is to regulate the supply of the flood-water. Each series has special feeder canals leading into it. The canals are shallow, and have their bed about half-way between the high and low level of the Nile. They therefore only run during the flood. The heads of the canals, where they take off from the Nile, remain closed by dams or by masonry regulators till the silt-bearing flood is coming down in sufficient strength, when they are opened and the basins filled. The lowest basins in each series are filled first, then the next lowest, and so on. For forty days the flood-water stands on the land, thoroughly soaking and washing it, and at the same time depositing the fertilizing silt. At the end of that time, through the escape at the lower end of the series, the water is discharged back again into the Nile.

If the flood is very high, or very slow in abating, the date at which the water is discharged and the basins dried has to be postponed. This seldom happens, but has a bad effect when it does. The over-soaking is said to be favourable to worms, and the ripening of the crops is delayed to an unfavourable season of the year.

The high lands lying between the river and the basin dyke are called berms, and may be irrigated by means of special high-level canals, which, starting from a point above the head of the basin system, or perhaps leading down from an upper system, pass by means of a siphon under the feeder canal. The berms are also irrigated by lifting water directly from the Nile.

In basin, as indeed in all irrigation, two things are of the utmost importance : to get the water on to the land, and to drain it off again. If the water were allowed to stand on the land, evaporation would take place, leaving a salt efflorescence; while, if the land is waterlogged, the water containing salts is drawn upwards by capillary action, and, when evaporation takes place, the salts are left in the soil.

*Perennial Irrigation.*—Crops such as cotton or sugar-cane are not suitable to basin irrigation, for, though they require to be watered all through the season, they would be ruined by complete inundation, and the shallow flood canals are well above the summer level of the river. Under perennial irrigation the value of the land is greatly increased, since crops of cotton or sugar can be produced, but there are disadvantages. The land is deprived of the full benefit derived from the annual renewal of the soil by the silt deposit. Agriculture becomes more difficult and intricate ; and the exhausted soil has to be dressed and manured. The basin irrigator makes much smaller profits, but he has less risk and anxiety.

Pumps, shadufs and sakias may be used as adjuncts to canal flow in perennial irrigation, where the water is not delivered at flood level. Basins and perennial irrigation are mutually exclusive.

#### ACTUAL MEANS OF IRRIGATION

<i>Year.</i>	<i>Pumps.</i>	<i>Sakias.</i>	<i>Shadufs.</i>	<i>Canals.</i>
1904 . . .	13	8,902 (9,932)	2,003	20
1905 . . .	20	9,744	2,338	19
1906 . . .	40	9,446	1,660	24
1909 . . .	41	9,349	1,440	25
1912 . . .	40	10,134	2,657	26
1913 . . .	42	10,075	2,670	24

*Irrigation Projects and Improvements*

The improvement of the river by new irrigation works in the Sudan has two main objects : to increase the water-supply of Egypt in the summer, and to secure a proportional advantage to the Sudan. It is considered best that the Sudan should get its supply from the Blue Nile and between such dates as will not interfere with the supply that Egypt requires from that river.

The main schemes in connexion with the White Nile are : (1) The regulation of the great lakes which feed it. (It is not believed that there should be any exceptional engineering difficulties in constructing control works at the outlets of the Nile from the Victoria and Albert lakes.) (2) The prevention of the waste of water caused by the vast swamps through which the Nile passes in the upper portion of its course. It is estimated that the schemes, if fully carried out would probably add considerably more than 50 per cent. to the discharge at Khartoum.

In the case of the Blue Nile the best and most complete project to utilize its water for increasing the summer supply appears to involve the construction of a regulator at Lake Tsana to convert this lake into a storage reservoir. As Lake Tsana is in Abyssinian territory this scheme is very difficult to realize, and by some its practicability is still considered an open question. A site for a dam and reservoir might possibly be found outside Abyssinian territory, i. e. between Famaka and Roseires, but, owing to the heavy slope of this reach, the storage capacity of such a reservoir could not be great. The storage capacity of Lake Tsana is possibly 7,000,000,000 cubic metres, and, if the water were discharged under control, it would give a daily discharge of 70,000,000 cubic metres for 100 days, or 38,000,000 cubic metres daily from January to June inclusive. In an average flood year possibly only 3,000,000,000 cubic metres could be abstracted from the river, but the balance of 4,000,000,000 cubic metres could possibly be retained from a previous and bigger flood year ; by this means full advantage could be obtained of the storage capacity and



the maximum of augmentation of supply made to a low summer river.

Other important schemes are in connexion with the proper storing and controlling of the waters of the River Gash to irrigate the country in the vicinity of Kassala, and of the waters of the rivers Atbara, Rahad, and Dinder.

In 1913 His Majesty's Government, under the powers conferred by the Government of the Sudan Act, authorized the British Treasury to guarantee interest at a rate not exceeding  $3\frac{1}{2}$  per cent. on sufficient stock and bonds issued by the Sudan Government to raise in the aggregate £3,000,000. The Sudan Guaranteed Loan Ordinance, 1913, authorized the raising of that sum by the Sudan Government, and specified the purposes to which the money so raised was to be applicable, viz. :

	£
1. <i>Irrigation</i> :	
(i) Works for irrigating the Gezira Plain. . . . .	1,000,000
(ii) " " " " Tokar cotton area . . . . .	100,000
(iii) " " " " Kassala cotton area . . . . .	200,000
2. <i>Railways</i> : Extension of Sudan railway system . . . . .	1,600,000
3. <i>Contingencies</i> . . . . .	100,000
	<hr/> £3,000,000

In 1915 the purposes to which the money so raised was to be devoted were revised as follows :

	£
1. Gezira Irrigation . . . . .	2,000,000
2. Extension of Railways . . . . .	800,000
3. Other Irrigation schemes and contingencies . . . . .	200,000
	<hr/> £3,000,000

In 1919 a revised act was passed increasing the sum to be raised to £6,000,000, to be allocated as follows :

	£
1. Gezira Irrigation . . . . .	4,900,000
2. Sudan Railway . . . . .	700,000
3. Tokar Irrigation . . . . .	400,000
	<hr/> £6,000,000

The reasons for the increased cost of the Gezira scheme were the increase on the area to be irrigated from 100,000 to 300,000 feddans, the increased cost of all works owing to the

war, and the necessity for paying interest out of capital until the paying stage is reached on the enlarged scheme ; under the smaller schemes this was to be done out of current revenue.

The Sudan irrigation service was formed in 1904, and completely reorganized in 1914. With the clearing up of a number of problems connected with the water-supply of Egypt as affected by the Sudan rivers, an Inspector-General at Khartoum became no longer necessary, and the inspectors at Khartoum (for the White Nile), Sennar (for the Blue Nile), Dongola, Tokar (for Tokar and Kassala) were made separately responsible to the Under-Secretary, Ministry of Public Works, Egypt, who, in addition to his other duties, undertook to advise the Governor-General on irrigation matters. At the same time these inspectors acted on instructions given by the Governors of the various provinces in which they were placed. The separate recruitment of the service ceased, and it was brought under the direct control of the Public Works Headquarters at Cairo.

The process of inquiry and construction has been necessarily slow, being complicated with questions of capital, labour, and communications. For some years operations were confined to the re-opening and improvement of old flood canals. The inherent difficulties of irrigation problems are well illustrated by the disappointing results attending the efforts made to dam the Gash which in flood time irrigates the land round Kassala. The land so irrigated is divided into (1) Nili, (2) Hod (i. e. cistern) basin, both situated near Kassala, and (3) Debeloweid basin, lying about 12 miles north of Kassala. For the first, water is available during the Gash flood as often as is required by the crop, the irrigation being by ordinary pump or sakia. The second is a series of basins of from 20 to 100 feddans, each of which can be filled during the flood for periods to suit the needs of different cultivators. In the case of Debeloweid basins a bank has been run across the main khor below the point where the river divides ; by means of this bank, which is provided with an escape regulator, the flood is checked, and the land irrigated for a considerable distance upstream.

The idea was advanced of gradually constructing a system

of control works at the apex of the delta, 5 miles north of Kassala. These would ultimately consist of two escape weirs and three canal-head regulating sluices dividing up the delta lengthwise into three triangular irrigated areas, separated by two broad spill channels to carry off excessive discharges. It was believed that eventually 100,000 feddans could thus be irrigated. It was also proposed to make a further system on the west bank of the Gash.

Unfortunately such works as were constructed suffered serious damage from violent floods, and both the Kassala and Debeloweid areas were annually liable to interruption and partial failure of irrigation. Such mishaps occurring practically every year in spite of various efforts to prevent or minimize them. Hence it was decided to suspend Debeloweid in order to bring about a balance of revenue and expenditure, and the area watered by the Gash was by 1911 reduced to some 1,500 feddans, mostly Nili. It is, however, still believed that, when the construction of the Kassala Railway should justify expansion, it ought to be possible to provide artificial irrigation to a maximum of some 200,000 feddans in the Gash delta at a cost of about £E2 per feddan. It was also supposed that when further extension was justifiable the small constant discharge of the Gash would probably be utilized in extension of the present Kassala canal system, and the development of the area west of the Gash would be served by the Khor Absumit, the supplies to which could then be controlled by the existing weir; while all discharge above this small constant amount would travel on down the present main Gash canal to irrigate the delta proper. Efforts to control supply in the delta would be in the direction of dividing up the water to make it irrigate thoroughly as large an area as possible and to prevent its flooding out.

In 1913 the land irrigated by the Gash works was about 2,500 feddans, of which 700 were watered by a new canal cut by the natives themselves under supervision. In 1916 work was begun on a canal at Fota with the object of re-opening the western Gash channel.

Like the attempt to irrigate Kassala Province from the

Gash, the effort to introduce basin irrigation into Dongola Province has not been very successful. Here eventually some 150,000 feddans can possibly be irrigated on the basin system. The basin schemes adopted were to a certain extent experimental, and have entailed more extensive drainage works than were anticipated. For this reason, and owing to outbreaks of various pests, some of the basins have been closed down and the rest are being remodelled. The basins were designed for an average Nile flood, but a series of low Niles followed their inception with the consequence that in certain years only small areas were flooded. In 1909 the extension of basin irrigation was recommended and approved, the total cost to be £E50,000, £E10,000 to be expended annually, and the scheme to affect an area of some 100,000 feddans. In addition to minor works, a beginning was made with a scheme for the irrigation of the Kerma plain, estimated to cost £E38,000 and to provide basin irrigation to 83,000 feddans, a sum of £E12,500 being granted as a preliminary instalment in 1909. For this sum the feeder canal to the basin and the Argo bank were constructed, and the works were calculated to bring under cultivation some 30,000 feddans.

The best basin areas in Dongola were considered to be Letti and Affat. In 1910 a sum of £E5,000 was granted for the Letti basin project, of this, however, £E1,250 was devoted to the Kerma basin for the extension of the main canal to improve the 'draw' and also to serve as a drain to carry forward water standing in deep depressions. In the Kerma basin some 26,000 feddans were flooded in 1910, of which 20,000 were cultivated as against 3,000 in 1909. The total area flooded in Dongola Province in 1910 was about 40,000 feddans. Besides clearing the Kerma basin and lengthening it by about 2 miles, the Letti basin was deepened about 2 ft., and widened from  $6\frac{1}{2}$  to 23 ft. Work was also carried out on the Nuri, Barkal, Gureir, and Affat basins, the last (which had not been flooded since 1882) having been re-opened. A new basin, the Mogassir, consisting of some 200 feddans of government property, had been constructed. In 1913 the Letti project was completed. The works involved : (1) enlargement of the canal to the full

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section originally designed ; (2) construction of a canal-head sluice ; (3) construction of the Saliba to divide the whole area into two basins ; (4) construction of the Saliba regulator. The total area to be flooded was about 11,000 feddans, of which 7,000 were believed to be first-class land. The tracts of Nafaab, Genetti, Goshabi, and Agri were also provided with basin canals. At Argo a head sluice was constructed. The total number of basins opened in the province was now sixteen.

The chief new work in Dongola Province in 1914 was the partial accomplishment of the scheme for the flood irrigation of Argo Island. Discharges measured regularly in the canal supplying the area showed that the quantity of water required per feddan was 8,000 cubic metres, or double the quantity usually allowed in Egypt.

The general conclusion to be drawn about Dongola basin irrigation is that, in a region where little or no protection is to be expected against years of failure, every possible step should be taken to profit from a high or average flood, and that the two requirements necessary to secure this are the deepening and extension of the feeder canals to carry silt-laden water to the extreme limits of the basins, and the construction of regulators and escapes to enable the basins to be properly discharged.

The following table is a summarized report on the Dongola basins up to and including the working season 1911-12 :

<i>Name of Basin.</i>	<i>Condition.</i>	<i>Total area. (Feddans)</i>	<i>Total cost. (£ E)</i>	<i>Area to date. (Feddans)</i>	<i>Cost to date. (£ E)</i>
Nuri	Completed	1,600	490	—	—
Barkal	"	350	300	—	—
Gureir	"	600	475	—	—
Korti	"	600	450	—	—
Taka-Mora	"	170	nil	—	—
Affat	"	900	610	—	—
Debbet el-Fogara	"	680	580	—	—
Gabria	Under construction	900	250	400	70
Letti	"	12,000	8,500	6,000	5,080
Megauda	Projected	970	700	nil	nil
Korma	Under construction	80,000	50,000	60,000	30,093
Ordi	"	500	250	200	nil
Maggasir	Completed	200	40	—	—
Argo	Projected	7,000	5,000	nil	nil

If the Dongola basins are the most ambitious scheme yet undertaken, the most important project is that for the irrigation of the Gezira plain. This was being put into effect in 1914, when it was stopped by the war.

The construction of a canal to irrigate the Gezira has been regarded as the great hope of the Sudan, as being the best means of rendering it satisfactorily self-supporting within a reasonably short period. It appeared evident in 1911 that as much as 3,000,000 feddans might ultimately be irrigated, and that meanwhile 750,000 feddans, the limit of the area for which the Blue Nile's winter supply would suffice in a low year, could be cultivated in flood and winter without detriment to Egypt. But it was farther considered that should development be undertaken under conditions which precluded water being drawn into the Gezira canal system for four and a half months of the year, viz., March 1 to July 15, these conditions would in time become very onerous, particularly if, as is practically certain, sugar-cane can be grown. The removal of these hampering restrictions, and the obtaining of a free hand in the matter of summer water supply could only be secured by the provision of compensation water supply for that volume required for the Gezira canal scheme. The conclusion to which the study of the problem pointed in 1912 was that, at the same time that the perennially cultivated lands of Egypt were increased by 500,000 feddans, the development of 500,000 feddans in the Sudan could be undertaken without detriment to the water supply of Egypt, provided an extra half milliard cubic metres of water were added to the river between January 21 and July 1, and that this could be done quite simply by the enlarging of the projected works on the Blue Nile.

By the end of 1913 a complete project for the irrigation of a block of land in the Gezira was prepared. The works were to comprise a dam on the Blue Nile at Makwar, 5 miles south of Sennar, a canal of about 44 miles in length, and the necessary canalization. The commission on the project reported favourably in 1914. It was estimated that the total cost of

the construction of the dam would be £E1,420,000, and that the cost of the Gezira canal would be £E580,000.

In 1914 the scheme was inaugurated by Lord Kitchener and the Governor-General. Work was put in hand and a contract made for the construction of the main canal. The outbreak of the war put a stop to the construction of the Makwar dam. It is intended, ultimately, to raise the water in the river to such an initial level that, after running in a canal more or less parallel to the river for about 36 miles it will be capable of raising the water-level over the whole area of 3,000,000 feddans ultimately contemplated ; meanwhile, the intention is to begin with an area of 300,000 feddans. From the nature of the site the work has no great storage capacity, being intended chiefly to feed the main canal in the Gezira. It is also intended to construct a dam at Gebel Auli on the White Nile, 28 miles south of Khartoum. This will reduce the water-levels below the junction of the White Nile and the Blue Nile, and lessen the danger of breaks of the protecting banks in Egypt, where the Nile during flood flows several metres above the general level of the country. This dam will also act as a storage reservoir for the supply of the water so impounded to Egypt during the following summer, when the natural flow of the river, even with the aid of the Aswan reservoir, is not sufficient for the requirements of the crops. In connexion with the Gezira scheme, in order to test cotton-growing on a commercial scale and to accustom cultivators to up-to-date methods of agriculture, two large areas at Tayiba and at Barakat at Wad Medani, comprising several thousands of feddans have been brought under cultivation by means of pumps. The area at Tayiba is managed by the Sudan Plantations Syndicate, the government being jointly interested. Barakat is the Syndicate's own enterprise.)

At Tokar, a valuable cotton-producing area in the eastern Sudan, it was necessary to set about controlling the uncertain distribution of the Khor Baraka flood. In 1911 it was estimated that the cultivated area could be increased by some 50 per cent., i. e. by 60,000 feddans, at a cost roughly estimated

at £E80,000. A grant of £E462 was made for the construction of an earthwork dam at Tokar. It was seen that the absolute control of the flood must start at the apex of the delta, and would require a head control bank near that apex, a longitudinal bank dividing the delta into two parts, and two weirs in the control bank, by means of which the flood waters could be passed wholly or in part into the eastern or western sections. A spill weir to deal with excessive floods was also necessary, and in Khor Shereit, an old course of the Baraka, the channel for dealing with such waste water existed. The work done in 1913 consisted in the construction of a bank at the off-take of the Khor Shereit from the Baraka, to prevent the latter from taking this channel (which nearly occurred in 1912), and thus being lost for irrigation purposes. The area flooded in 1913 was 36,000 feddans as against 53,000 in 1912. This reduction in the cultivated area emphasized the need for carrying out control works on the Baraka. The total area well flooded in 1915 was 30,000 feddans.

The laying-out and canalization of the native lands supplied with water by pumps at Zeidab, Berber Province, was nearly completed by the middle of 1916. A further area at Timerab was taken up in 1917.

Pumps for extending the food supply are in course of being erected by the government at Nuri, Gharb Dongola, and Gureir in Dongola Province, and at Bouga, Kitiab, Gendetu, Berber, and Besabir in Berber Province. These schemes comprise about 15,000 feddans. A large basin scheme of several thousand feddans is nearly completed at Wad Hamid in Berber Province. Several old canals have lately been reopened in this Province.

Investigation of the possibility of development of the tract between the Rivers Rahad and Dinder was proceeded with, and in 1912, after a survey, it was estimated that some 140,000 feddans in the northern half of the tract could be irrigated by means of a canal taking out above a barrage across the River Rahad in the neighbourhood of Id Fama and running down the centre of the tract, at a cost of £E700,000 or £E5 per feddan.

In connexion with the important question of how to rescue the waters of the Upper Nile from the marshes of the southern Sudan, experimental dredging operations had in 1910 deepened the channel of the Bahr el-Zeraf so as to allow free navigation throughout the year, and excavated a channel which gave that river direct perennial communication with the Bahr el-Jebel. This was expected to add very considerably to the summer supply.

In 1912 the new connecting channel between the Bahr el-Jebel and the Bahr el-Zeraf north of Shambe had been excavated, thus providing in the Bahr el-Zeraf an alternative highway to the Bahr el-Jebel, navigable all the year round. During 1913 the dredgers had excavated a second cut from the Bahr el-Jebel into the Bahr el-Zeraf and improved the upper reaches of the latter to enable it to carry ultimately 150 cubic metres. No very definite reduction of losses have, however, been observed.

The proposals put forward in 1911 involved the remodelling and embanking of the Bahr el-Jebel and the Bahr el-Zeraf to enable them to carry through the sudd region an increased supply adding over 200 cubic metres per second to the river's natural supply at Aswan in years of low supply ; the dredging necessary was estimated to take 17 years and to cost £E100,000 annually for that period. Dredging operations have not, however, been continued.

The outbreak of the war interfered to a considerable extent with irrigation investigations and works. Work on the Blue Nile Dam at Makwar had to be practically shut down early in the war. A fresh start was made in 1917 and 1918 with revised estimates, owing to the greatly increased cost of all materials, and considerable progress was made with preliminary building.

The work at Jebel Aulia on the White Nile was confined during the war to the collection of data and the preparation of the site.

## CHAPTER IX

### RESOURCES

Cultivation in general—Agricultural products—Forest products and animal spoils—Mineral deposits—Oil—Pearl-shell fishery—Live stock.

#### CULTIVATION IN GENERAL

AGRICULTURE in the Sudan is dependent for water supply on : (1) rainfall, (2) flood irrigation, (3) artificial irrigation. (See under ' Nile Régime ', p. 350, and ' Irrigation ', p. 365.)

Under rainfall the chief crops grown are dura, dukhn, sesame, earthnuts, and, to a small extent, native cotton of short staple. The average area under rainfall cultivation is approximately 1,750,000 acres. The area cultivated varies greatly from year to year according to the nature of the rains. Estimates of the total area under cultivation are accordingly somewhat uncertain.<sup>1</sup>

A large variety of produce is grown under flood irrigation. The chief crops are cotton, maize, dura, dukhn, wheat, barley, lubia, pigeon pea. The average annual area under flood irrigation up to 1914 was approximately 100,000 acres.

Artificial irrigation is confined chiefly to the provinces of Dongola, Berber, Blue Nile, and Khartoum. The chief crops are cotton, wheat, barley, maize, dura, dukhn, lubia, sesame, and, to a less extent, earthnuts, beans, lentils, sugar-cane, onions, melons. In the winter months most European vegetables can be grown successfully. The average annual area under artificial irrigation is 100,000 acres.

The methods of cultivation are primitive and the agricultural implements generally rude, the bulk of the cultivation

<sup>1</sup> The areas under cultivation and averages given have also frequently to leave out of account the period subsequent to the outbreak of war, the figures for the years subsequent to 1914 not being available.

being still performed by the *fass* a kind of digging hoe. Manuring is never resorted to, except to a very limited extent in the northern provinces, worn-out land being renewed by fallowing.

Over very large areas what is produced beyond local needs has no fixed centre of exchange, and the remoteness of the nearest market, with the difficulty of communication, diminishes the incentive to produce beyond local requirements. Nevertheless, the Sudan has vast possibilities as an agricultural country. Cotton cultivation is capable of very great and profitable development, and wheat, barley, and sugar might be grown in sufficient quantities to furnish an export trade. As things actually are, wheat is not grown in any quantity, except in Dongola, Berber, and Khartoum, and very little of the crop leaves the country. It represented only 2 per cent. of the total cultivation up to 1916, when efforts were made to increase the area under crop. In 1913 the wheat area was 30,039 feddans ; it rose to over 40,000 in 1918.

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The year 1912 was notable for the promulgation of the Cotton Ordinance for the regulation of the industry. It confers on the Department of Agriculture powers to control cultivators, ginner, and merchants, with the object of maintaining and improving the quality of cotton. A government ginning and preserving factory has been erected at Port Sudan. The Tokar crop passes through the government market, and is graded, weighed, baled, and sealed before leaving the enclosure, two government classifiers being employed.

The obstacles to the development of cotton cultivation, as, indeed, to all perfected agriculture, is the insufficiency of the system of irrigation, the want of resources, and the ignorance of the natives. Inspectors of agriculture do their best to instruct and guide the natives, and the treasury lends to those who own lands sums necessary for the improvement of their holdings. If slow, agricultural progress is steady and general, the character of the agriculture showing an advance irrespective of the volume of the crop produced. The natives show an increasing interest in the production of crops such as sesame, cotton, wheat, maize, other than those required to satisfy their personal needs, and a certain readiness to adopt improved methods of cultivation and handling. Experimental farms have had a valuable educational effect.

The date palm (*Phoenix dactylifera*, Linn.) is largely grown north of Khartoûm, and is a considerable source of revenue, a tax at the rate of 2 piastres (5d.) per tree was levied in 1914 from which the receipts were £E17,692; in 1919 it yielded £E21,300. There is a large local demand, and considerable quantities are exported, mainly to Egypt.

The production of oil seeds is one of the most important of the minor cultivations in the Sudan. In addition to sesame, cultivated largely in Kassala, Sennar, Kordofan, the Blue and White Nile Provinces, ground nuts, senat, castor and safflower seeds are grown on a smaller scale, while the shea butter tree (*Butyrospermum Parkii*, lulu tree) occurs in



many parts of the Bahr el-Ghazal. The production of castor seed has not yet reached a commercial stage, but the seed could be profitably grown in many parts of the Sudan. The *senat* plant might yield an important export, if the cost of transport could be reduced. The oil expressed from the seed is used for edible purposes; the seeds are also dried, crushed, and eaten, the leaves and fruit cases being used as animal food. The shea butter tree nut is a staple food. Edible oil, much used in cooking, is extracted from the kernel.

There are a great number of insects which infest the cereal, fruit, and cotton crops, working great havoc among them. Prominent among these are several species of aphis, notably *Aphis sorghi* (Arabic *asal*), which often ruins *dura* crops. *Dura* also suffers from a red and green bug (*Lygaeus militaris*), and from a moth (*Sesamia cretica*) known as the 'dura stem-borer'. The caterpillars of this moth breed also on maize and sugar-cane; they may be destroyed by rooting up plants whose withered centre leaves betray their presence in the stem, or by burning stubble after harvest. Cotton has its own 'stem-borer', the *Sphenoptera neglecta*, and is damaged by a small brown beetle (*Nisotra uniformis*), and the Pink Boll worm has recently appeared in the Sudan. There are many other caterpillars, while fruits, e. g. melons, figs, oranges, have each their own destructive weevil, bug, or fly.

Much damage is done all over the country by several species of *Termitidae*, popularly called 'white ants', while it is often visited by swarms of locusts. Energetic measures have been taken by government to combat these. They include the destruction of the eggs and young unfledged locusts by ploughing or trampling the soil, burning the grass, and digging ditches, and the driving off of approaching swarms by noise and smoke.

The cultivating season 1913-14 was unsatisfactory. Rains and rivers failed the cultivators, and there was a decrease of about 200,000 feddans in the area under crop. Cotton showed a marked decrease on the previous year, chiefly due

to the poor flood on the Baraka. The area under dura was nearly 100,000 feddans below the figure for 1913, while dukhn, sesame, and wheat all showed decreases amounting to some 19,000 feddans. The decrease in the area under wheat was mainly due to the collapse of agriculture in Dongola Province, where none of the basins were flooded, while on the sakia land the impoverished condition of the cultivators and the loss of cattle caused an almost complete cessation of agricultural work.

The following table was given in 1914 to show (in feddans) the areas of cultivated land in the years 1911-14 : <sup>1</sup>

	1911.	1912.	1913.	1914.
(1) Irrigated by artificial means . . . . .	116,000	120,000	130,000	58,000
(2) Irrigated by natural agency :				
(i) By flood . . . . .	129,000	157,000	123,000	79,000
(ii) By rain . . . . .	1,458,000	1,660,000	2,050,000	1,959,000
Total (in feddans) . . . . .	1,703,000	1,937,000	2,303,000	2,096,000

The table on p. 385 gives (in feddans) the crops under cultivation in the years 1911-13.

The table on pp. 386, 387 gives the dates of the sowing and reaping and the yield per feddan of different important crops in the various districts.<sup>2</sup>

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The area of land cultivated during the years 1918-19 is analysed as follows :

	1919. <i>Feddans.</i>	1918. <i>Feddans.</i>
1. Irrigation by artificial means from the river .	111,065	114,781
2. Irrigation by natural agency—		
(a) By flood or rise of river . . . . .	102,545	225,030
(b) By rain . . . . .	1,456,200	1,861,000
Total . . . . .	1,669,810	2,200,811

The area shown as irrigated by artificial means is made up as follows :

	<i>By native methods.</i>	<i>By pumps.</i>
1919 . . . . .	83,553	27,512, including 10,400 feddans summer water.
1918 . . . . .	88,121	26,660, including 10,200 feddans summer water.

The very large increase in the area cultivated in good seasons is a most valuable index of the productive capacity of the native cultivator, when conditions are favourable, and the strongest possible argument in favour of schemes of development designed to make such conditions permanent, by the provision of irrigation to supplement rainfall, or the construction of control works to regulate the inundation of areas affected by the floods referred to.





<i>District and grain.</i>	<i>When sown.</i>	<i>When reaped.</i>	<i>Average yield per feddan.</i>	<i>Remarks.</i>
<i>Dongola</i>				
Wheat . . .	Nov. and Jan.	April and May	4½ ardebs	
Barley . . .	Nov. and Dec.	Mar. and April	5 ardebs	
Maize . . .	July	Sept. and Oct.	6 ardebs	2 crops.
Dura . . .	June and Sept.	Sept. and Dec.	6 ardebs.	
<i>Berber</i>				(1 kantar—315 rotls (unginned)).
Cotton . . .	May	Dec. to Feb.	3 kantars	
Wheat . . .	Nov.	Mar. and April	4½ ardebs	
Barley . . .	Nov.	Feb. and Mar.	5 ardebs	
Dura . . .	Aug. and Sept.	Dec.	5 ardebs	
<i>Khartoum</i>				
Cotton . . .	May and June	Dec. to Feb.	3 kantars	
Wheat . . .	Nov.	Mar.	4½ ardebs	
<i>Gezira</i>				
Dura . . .	July	Nov.	4 ardebs	Rain cultivation.
<i>Kordofan and Nuba Mountains</i>				
Dukhn . . .	July	Oct.	4 ardebs	"
Sesame . . .	July	Oct.	2½ ardebs	"
<i>Gedaref</i>				
Dura . . .	July	Nov.	4 to 5 ardebs	"
Earthnuts . . .	July	Jan.	4 ardebs	"
Sesame . . .	July	Oct. to Nov.	3 ardebs	"

<i>Kasala</i>						
Dura	.	.	July	Nov.	5 ardebs	Early maturing duras. Rain and Nili irrigation from Gash.
"	.	.	Sept. and Oct.	Mar. and April	7 to 8 ardebs	Gash flood. Varieties, Aklimoi and Toleb; heavy-yielding duras of good quality.
Cotton	.	.	July	Dec.	1½ kantars	Uncertain. Rain and Nili irrigation till middle of August.
"	.	.	Sept. 1 to 15	Mar. and April	3 kantars	On Gash Delta-Basin irrigation.
Earthnuts	.	.	Sept.	Mar.	4½ ardebs	" "
Castor	.	.	Sept.	Mar.	17 kantars	" "
Sesame	.	.	July	End of Oct.	4 ardebs	(1 kantar = 100 rotls).
Maize	.	.	July	End of Oct.	7 ardebs	Rain and Nili irrigation.
<i>Takar</i>						" "
Cotton	.	.	Aug. 15-Sept. 7	Early in Jan.	1½ to 3 kantars	Baraka flood.
Dura	.	.	Aug. to Oct.	Jan. to Mar.	5 to 8 ardebs	Flood and rain yield variable according to irrigation.
Dukhn	.	.	Aug. to Oct.	Dec. to Feb.	4 ardebs	" "
<i>Tayiba</i>						" "
Cotton	.	.	From July 15	Early in Dec.	—	Pump irrigation

## AGRICULTURAL PRODUCTS

*Dura*

*Dura* (*Sorghum vulgare*) is practically a universal crop, about 61·7 per cent. of the total cultivated area, especially plentiful in Berber, Khartoum, the Gezira districts, Kassala, and the Nuba mountains. The Gezira is the granary of the Sudan. There are often two crops, an early one sown in June or July, known as Naggad, and a later crop sown in September or October. The time of sowing depends on the district and variety. An average period for early maturing duras on rain land is 90–95 days, but, if hastened, a fair yield can be got in 70–75 days. On heavy rain land 110–120 days are required, and late-sown duras, e.g. in the Gash delta, require 130–145 days. In good rain years large crops are cultivated, and the grain, which is the principal food grain of the country, is available for export in quantity; in bad years Indian dura has to be imported, sometimes in large quantities. In 1903, 531,876 and in 1913, 1,393,344 feddans were under dura. In 1917 the quantity of dura exported was 84,779; in 1918, 54,945; in 1919, 1,656 tons.

The production of this commodity is incidentally one of the principal causes of the labour difficulty; being economical and nourishing it allows the Sudanese to live almost for nothing, as land is cheap and the grain is grown with little labour. Its albuminoid nutrient ratio is higher than that of wheat, and its fat content is especially high, being 3·3 per cent., as against 1·2 per cent. in wheat. It is either baked into flat wafers (*kisra*), or boiled (*asida*), and is also made into a sweet beer (*merissa* or *Um Bilbil*). As food for animals dura is believed to be less heating than dukhn. Dura stalks (*gasab*) are a valuable forage.

Feterita (which can be kept stored in large bulk in grain pits for several years) is the variety most grown in the Gezira; it is very nutritious and good for cattle.

Sudan dura is a satisfactory feeding-stuff for pigs and poultry, about equal in value to maize. It could probably

be substituted for maize in the manufacture of certain kinds of spirits. In the brewing industry, and in the manufacture of starch and glucose, the use of *dura* instead of maize presents certain technical difficulties which could probably be overcome.

During the war *dura* flour was used in the Sudan to dilute wheat flour owing to scarcity of the latter.

### *Dukhn*

Dukhn (*Pennisetum typhoidum*), bullrush or spiked millet, requires less water than *dura*, has a shorter period of growth, and will grow on poorer soil. It occupies 25 per cent. of the whole cultivated area. It is largely grown in Kordofan (the dukhn of which is famous) and in many other parts of the country. In 1903 there were 25,571, and in 1913, 567,194 feddans under dukhn. It is largely used as human food in the Western Sudan.

### *Maize*

Maize (*Zea Mais*) is chiefly grown along the banks of the Blue Nile in Sennar Province, to some extent in the heavier rain land, and in the northern provinces under artificial irrigation and on the river banks. The period of growth is 100–20 days, the time being somewhat prolonged under artificial irrigation. There were in 1903, 10,632, and in 1913, 23,806 feddans under maize.

Sudan maize compares favourably with South African 'Hickory King' and surpasses it in the percentage of protein present. The percentage of oil (ether extract) is high. Like South African maize, it has the advantage over North and South American maize of being much drier, and consequently better suited for transport. Such faults as it has could be remedied by planting only the whitest kernels.

### *Wheat*

Wheat growing has increased steadily in recent years, but its area is still small in comparison with *dura*. There were in

1903, 16,057 feddans under wheat, in 1910, 19,681, in 1911, 26,972, in 1912, 29,193, in 1913, 30,039, and in 1917 there were some 40,000 acres ; while 1918 saw a still further extension.

The wheat is grown almost entirely under irrigation, artificial or flood ; it was grown as a rain crop on only 176 feddans in 1910, on 20 in 1912. At present wheat is cultivated chiefly in Halfa, Dongola, Berber, and Khartoum Provinces.

As a war measure, to supplement the food supply of Egypt and the Sudan, an area of 15,000–20,000 feddans was put under cultivation in Berber and Dongola provinces by means of pumps driven by oil engines. Wheat was to be the principal crop on these pumping stations.

The Central Research Farm at Khartoum North supplies water to natives for wheat cultivation.

Wheat is grown on the ' Basins ' in Dongola Province. Parts of western Kordofan and Darfur are also suitable for wheat production. Good crops can be grown in the Gezira. Winter crops are sown from the beginning of November to December. Wheat takes 130–50 days to mature.

At the present time the production does not meet local requirements, and considerable quantities of wheat and flour are imported, the statistics for recent years giving the value of such imports as £E4,358 for 1911, £E23,009 for 1912, and £E15,654 for 1913. In 1914 it rose to £E39,466. In 1917 it had fallen to £E5,391. The samples of wheat grown under irrigation at the Gezira Agricultural Experimental Station which were examined at the Imperial Institute in 1913 were on the whole like good average Indian wheats. The ' Dongola ' wheat yielded the best flour.

### *Barley*

Barley is grown mainly in the northern provinces under artificial irrigation, and a certain amount under flood irrigation and on the river banks. As a winter crop it is sown from the beginning of November to the middle of December, and takes 110–20 days to mature. There were in 1903, 11,541, and in 1913, 8,942 feddans under barley.

*Rice and Tapioca*

Rice and tapioca were reported in 1906 as grown successfully in the Bahr el-Ghazal. Successful experiments in the cultivation of hill rice were made at Meridi in 1913. Similar attempts are now being made at Wau and Lau.

*Manioc*

Manioc, called by the Zande *Buфра*, is largely cultivated by them in the southern Bahr el-Ghazal. Its flour is considered greatly superior to that of *dura*. It is eaten in the form of a paste and closely resembles tapioca.

*Coffee*

Coffee of promising quality was, in 1915, found growing wild in the Kaji Kaji district of Mongalla. The Yei district of Mongalla Province appears to be well suited for coffee growing and experiments are being carried out at the Government Farm at Kagalu where European and Indian fruits are also being grown successfully. It is possible that coffee could be grown in the Red Sea hills.

*Castor*

An excellent variety of castor-oil seed (*Ricinus communis*) grows wild in Kordofan. It is also found in the Upper Nile Province, and in many other parts of the country, but is not exported in any large quantity. It is cultivated on the river banks in Halfa Province.

*Sesame*

Sesame (*Sesamum orientale*, *simsim*) is grown chiefly on rain land, and mainly in Sennar, White Nile, Kassala, and Kordofan. It is sown in July, and the period of growth is 110-20 days. After *dura* and *dukhn* this yields the most plentiful crop. Sesame yields a valuable oil (some seeds contain 50 per cent. oil) employed in the Sudan as an article of food, and in Europe in soap making and the preparation

of edible oils and fats. In good years large quantities are exported. In 1903 there were 14,230, and in 1913, 118,398 feddans under sesame.

#### *Senat*

Senat (*Cucumis melo* var. *agrestis*), common in the natural state, is not extensively cultivated. The seed contains 37 per cent. oil. If exported it would certainly find a market. It can be grown practically anywhere in the central and southern Sudan.

#### *Earthnuts*

Earthnuts (*Arachis hypogaea*) are grown on certain favourable rain lands in Kordofan, Upper Nile, White Nile, and Dar Nuba, also under flood and artificial irrigation in Blue Nile, Khartoum, and elsewhere. Sown in July or August, the period of growth is 5½-6 months. Considerable quantities are exported. There were in 1906, 623, and in 1913, 18,224 feddans under earthnuts.

#### *Lubia*

Lubia (*Dolichus lablab*) is widely grown under flood or artificial irrigation. During growth the leaves, and later the beans, are used as vegetables by the natives. It is a valuable fodder crop. It may be sown at any time of the year, and is used as a renovating crop.

#### *Pineapples, Bananas*

Pineapples have been grown successfully at Meridi in the Bahr el-Ghazal. Bananas are indigenous in the three southern districts of the Bahr el-Ghazal, where they form a zareba round the native huts.

#### *Water Melons*

Vast areas of water melons are cultivated in Kordofan to eke out the scanty water supply particularly for gum pickers. The seeds yield a useful edible oil and are exported in small quantities.

### *Dates*

Dates are extensively grown, especially in Dongola, Berber, Halfa, and Kordofan. The dates as a whole are of the 'dry' kind, not regarded as the best for overseas export. Certain varieties, e. g. 'Bertamoda' and 'Gondeila' can be made 'soft' and remain so for long periods. In Berber special efforts have been made to encourage production by shoots from Halfa and elsewhere. Good Halfa dates are good quality ordinary dates, to be classed with Persian dates. Algerian dates, Deglet el-Nur, have been successfully introduced into Dongola province.

### *Tobacco*

Tobacco is grown in considerable quantities in the Nuba Mountains and to some extent in the southern Bahr el-Ghazal and other parts of the southern Sudan. It has an unpleasant flavour owing to the admixture of wood ashes. There is a great demand for this tobacco among the Dinka. The best varieties are grown at Jebel Nyima and Jebel Tira el-Akhdar and in Darfur. The cultivation of tobacco for export is prohibited in accordance with the agreement between Egypt and foreign powers.

### *Vegetables*

Bamia (lady's finger, *Hibiscus esculentus*) is grown on the islands of the Nile, on the river bank in the White Nile Province, and also in Kordofan and the Bahr el-Ghazal. Onions (*basal*) are greatly in demand, and there is a considerable increase in their cultivation by the Nuba. Large quantities are grown in the White Nile and Kordofan. In 1903 there were 100, and in 1913, 3,799 feddans under onions. Sweet potatoes are grown in the southern Bahr el-Ghazal. European vegetables are only cultivated at a few of the government posts. Tomatoes and beans thrive especially well. Potatoes, peas, carrots, and turnips do excellently; cauliflowers and cabbages are less satisfactory.



*Minor crops*

There were in 1906, 36, in 1912, 325, and in 1913, 59 feddans under sugar cane. Other minor crops are : lupine (*Lupinus albus*), pigeon pea (*Cajanus indicus*), safflower (*Carthamus tinctorius*).

*Cotton*

The question of cotton is of great importance to the Sudan. In 1903 there were 47,418, and in 1913 only 37,771 feddans under cotton. This was the least satisfactory of any of the crop returns for 1912-13, and was largely brought about by the diminished flooding at Tokar. Nevertheless it is possible that cotton may become the chief export crop, and the development of its cultivation the surest way of providing for the economic future of the Sudan. The quantity of ginned cotton exported in 1913 was 2,315 tons, in 1914 1,712 tons. In 1915 the export was 4,305 tons, in 1916 2,941 tons, and in 1917 4,168 tons.

Cotton is grown under flood and artificial irrigation. Egyptian varieties of good quality are grown in the Khartoum and Berber Provinces and in the Gezira under pump irrigation ; also in the eastern Sudan on the deltas of the Baraka and Gash under flood irrigation. On these deltas, especially the Baraka, the climate is very suitable for Egyptian varieties. In the Khartoum and Berber Provinces the climate is less suitable for the growth of Egyptian varieties, and in recent years the tendency has been to introduce the long-stapled American varieties which mature more quickly. As regards the Tokar (Baraka) crop, there has been a tendency in recent years to consider American cotton as superior to Egyptian for Sudan purposes. But the matter cannot be regarded as finally determined, and any wholesale substitution of American for Egyptian varieties must only be made after the most careful and exhaustive experiment. Of the Egyptian varieties Mitafifi proved (1910-11) superior to Abassi, and, though the latter gave a better lint, it was considered that the

former would prove the more suitable for cultivation in Tokar. The American cotton gave a yield one-half to three-quarters as much again as Mitafifi on moderately irrigated land, and the difference in favour of the former increases the lighter the irrigation. The Mitafifi cotton gave a higher percentage of lint and cost less to gin.

The period of growth of American cotton is about 30 days earlier ; it gives a big flush of cotton early in the season, has a lower and sturdier habit of growth, and is therefore less readily damaged by wind ; it is more easily picked and requires less irrigation. In 1913 the shorter stapled and earlier maturing American kinds gave the better results in Berber province, the Egyptian kinds being disappointing. The Tokar cotton fetched prices equivalent to the best Upper Egyptian varieties till the end of May, when, owing to climatic conditions, Tokar cotton deteriorates.

The disadvantage of American cotton is that ordinary qualities meet very great competition from other cotton countries. At Tayiba and Barakat test stations, several thousand feddans in extent, for the Gezira irrigation scheme, Egyptian varieties of good quality have been successfully grown. A native variety is grown in certain localities. This is quickly maturing, hardy cotton, of short staple and poor quality. It is generally consumed locally, being woven into the native cloth called *damur*.

The time of sowing varies with the locality and the variety grown. On the Baraka and Gash deltas Egyptian cotton is sown in August and September, and picked in February, March, April, and May. In the Khartoum and Berber Provinces under pump irrigation May and June are considered the best months for sowing Egyptian cotton, and picking takes place in December, January, and February. In the Gezira Egyptian cotton under pump irrigation is sown in July and August and picked in January, February, and March.

The monthly report of the Sudan Government Central Economic Board for July 1918 stated that the total of the

year's cotton crop for that year was estimated at 8,300 kantars of 315 rattles, unginned; this was 5,000 kantars below the estimate of the probable crop made in January.

At least 3,300 kantars of the deficit were due to the fact that a large quantity of the cotton, as soon as it was ripe, was allowed to fall to the ground and become so covered with dust and sand as to be quite useless for sale.

A severe outbreak of 'Asal' which attacked the later grown cotton accounted for the remainder of the deficit.

Considerable difficulty had been experienced in obtaining sufficient camels to transport the ginned cotton to Atbara and Suakin.

Cotton seed was being issued sufficient for a crop of 10,000 kantars of 315 rattles only in 1919, as this was probably the maximum which could be dealt with owing to the shortage of camels.

The output of cotton at Tokar for 1907-16 is shown in the following table :

Season.	Tons.	Seed Cotton. Prices per ton.		Total value. £	Ginned Cotton. No. of Bales. <sup>1</sup>
		£	s. d.		
1907-8	3,981	12	9 0	49,563	7,022
1908-9	2,343	19	10 3	45,718	4,133
1909-10	4,361	34	10 0	150,454	7,693
1910-11	6,912	21	19 6	151,891	12,193
1911-12	4,982	19	2 10	95,364	8,788
1912-13	5,077	23	7 2	118,590	8,957
1913-14	2,936	20	15 8	61,020	5,168
1914-15	9,035	12	15 8	115,497	15,973
1915-16	5,692	20	11 0	116,970	10,060

The report of the Sudan Plantations Syndicate for the year ending June 1917 stated that the issued share capital remained at £135,000, and the debenture capital at £57,000. The crops from the three stations handled at the ginning factories in 1916-17 were as follows :

					Bales.	
					1916.	1917.
Barakat	.	.	.	.	1,687	1,956
Tayiba	.	.	.	.	1,010	1,432
Zeidab	.	.	.	.	2,080	1,631

<sup>1</sup> One bale weighs 400 lb.

There was a net profit of £14,838 bringing the total credit balance to £24,514.

The following table shows the total export of cotton (in Bales) for 1911-16 and the proportion contributed by Tokar and by other places :

<i>Year.</i>	<i>Total export. Bales.</i>	<i>From Tokar.</i>		<i>From other places.</i>	
		<i>Bales.</i>	<i>Percentage of total.</i>	<i>Bales.</i>	<i>Percentage of total.</i>
1911 .	22,823	12,193	53.4	10,630	46.6
1912 .	15,000	8,788	58.6	6,212	41.4
1913 .	12,830	8,957	69.8	3,873	30.2
1914 .	9,435	5,168	54.8	4,267	45.2
1915 .	23,765	15,937	67	7,828	33
1916 .	16,219	10,061	62	6,158	38

### FOREST PRODUCTS : ANIMAL SPOILS <sup>1</sup>

The total area of reserved forests in 1913 was 207 square miles.

The most important product belonging to this section is gum, and next to it come ivory, feathers, firewood.

The following amounts (in kantars) of gum, ivory, and feathers were exported during the ten years 1905-14 :

<i>Year.</i>	<i>Gum.</i>	<i>Ivory.</i>	<i>Feathers.</i>
1905 . . . .	158,000	1,720	318
1906 . . . .	162,000	1,500	500
1907 . . . .	204,961	1,931	474
1908 . . . .	224,523	1,109	200
1909 . . . .	295,129	1,334	264
1910 . . . .	301,717	1,750	605
1911 . . . .	319,043	2,219	371
1912 . . . .	436,578	2,374	153
1913 . . . .	336,728	2,792	130
1914 . . . .	275,375	2,054	85

The quantity of gum exported in 1914 represented a value of £E314,919, of ivory £E84,605, of feathers £E3,999. In 1917 gum and ivory represented values of £E744,345 and £E57,251 respectively.

The table on p. 399, since it is not possible to give the

<sup>1</sup> See also Appendix V.

yield of all the products in quantity (the figures are not available), merely shows the source and value of the revenue obtained from forest produce during the year ending September 30, 1913 :

### *Gum*

The Sudan and Senegal are the two great gum-producing countries of the world. In general it is considered that the Kordofan gum is the more uniform in composition, and that the Senegal trade gums have a marked proportion of weaker varieties. Gum is normally the largest export of the Sudan, and the natives take an increasing share and interest in its collection. In 1912 the output, 19,615 tons, was the highest recorded, the increase being mainly due to the extension of the railway to El-Obeid, which made the gum districts more accessible. In 1913, 15,129 tons (value £E371,528), in 1914, 12,372 tons (value £E314,919), and in 1917, 16,613 tons (value £E744,345) were exported. The forests belong to the Government.

Gum which is not a cultivated product is obtained almost entirely from the *Acacia verec*, from which is drawn the two qualities of gum known as *Hashab Kordofan* and *Hashab Gedaref*. The gum called *Talha* is produced by the *Acacia seyal*, which grows in great abundance in the Upper Blue Nile, but is not exploited, owing to want of means of transport, water and stores, and the small demand for this kind of gum. The report of 1907 on Tartar (*Stercutia cinerea*) from Sennar was very favourable, but it has not yet been exploited. The Sudan contains numerous other gum-yielding trees, including the *Acacia arabica*, but there is at present no demand for the gum obtainable from them. The department of forests has in hand various measures for the maintenance and improvement of the output of gum, especially in Kordofan Province, whence most of the Hashab gum is obtained, the Forest Ordinance conferring on it extensive powers for the improvement of transport and the preservation and sale of the crop.

Province.	Timber.	Firewood collected through department.	Firewood collected through province.	Rubber.	Gum.	Other forest produce.	Total.
	£E.	£E.	£E.	£E.	£E.	£E.	£E.
Bahr el-Ghazal	.	1,740	126	133	—	—	2,109
Berber	.	60	158	—	—	607	1,537
Blue Nile	.	45	192	—	—	?	1,176
Kassala	.	20	70	—	3,066	?	3,362
Khartoum	.	—	291	—	—	56	347
Kordofan	.	—	166	—	52,983	?	53,149
Mongalla	.	3,271	?	?	—	—	3,271
Red Sea	.	—	460	—	—	230	690
Sennar	.	53	325	—	4,698	35	5,139
Upper Nile	.	35	8,575	—	815	10	9,438
White Nile	.	40	6,809	—	5,086	• 12	12,019
Total	.	363	22,577	133	66,648	950 <sup>1</sup>	92,237

<sup>1</sup> Most of these figures have been obtained from the Customs Department returns.

The principal gum regions are the forests of Kordofan. Certain parts here have been worked out, but enormous gum areas remain. Where the gum-belt approaches the White Nile the country consists of a dead flat plain of hard clay, on the surface of which rest numerous sand ridges upon which the gum is produced. The succession of crops, fallow, and gum 'gardens' really form a slow rotation of crops in Kordofan, where the soil soon becomes exhausted under any one crop. New areas have been and are being opened in other parts of the Sudan, notably in Kassala (Gedaref and Mafaza) and Upper Nile Province, and in Sennar, where there is a large expanse of hashab forest practically untapped in 1913. There are large areas both of hashab and talha in the districts of Singa, Karkoj, Dinder, and Roseires.

The method of extraction is simple: In January strips of bark are torn from the trees, dead branches cut away, and in well-managed gum 'gardens' the grass is cut as a protection from forest fires. When the hot weather comes the sap oozes out of the wound and is collected every few days. When the rains begin the flow of the gum ceases.

An important element in securing a good price in European markets is the cleanness of the gum.

Kordofan gum, though all collected from the *Acacia verec*, has different varieties. The 'hard' variety, known as 'Khartoum', is collected from young trees and used for dyeing and finishing silk and other fabrics. The 'soft' grade, known as 'Kordofan', is the product of more fully matured trees and is used for confectionery and pharmaceutical products. Lower grades are used in the manufacture of inks, matches, stationery, &c.

A summary of the production of gum in 1913 is given on p. 401.

### *Ivory*

The ivory trade is connected with Upper Nile, Mongalla, Kordofan, and Bahr el-Ghazal, but elephants are now almost extinct in southern and south-western Kordofan. The trade

<i>Departments and provinces.</i>	<i>Hashab.</i>		<i>Gezira.</i>		<i>Talh.</i>		<i>Total.</i>	
	<i>Kantars.</i>	<i>Rolls.</i>	<i>Kantars.</i>	<i>Rolls.</i>	<i>Kantars.</i>	<i>Rolls.</i>	<i>Kantars.</i>	<i>Rolls.</i>
Sudan Customs <sup>1</sup>	23	55	3	16	6	75	53	46
Kassala . . .	13,615	10	—	—	527	45	14,142	55
Kordofan. . .	240,833	67	—	—	—	—	240,833	67
Sennar . . .	12,001	37	—	—	18,706	85	30,708	22
White Nile . . .	23,075	51	—	—	83	56	23,159	7
Upper Nile . . .	503	49	—	—	6,401	52	6,905	1
Total . . .	290,052	69	3	16	25,726	13	315,781	98

<sup>1</sup> These figures represent gum of which the province of origin is unknown.



was steadily increasing until the outbreak of war. In spite of precautions and regulations, it is believed that much wanton slaughter of immature and female elephants is committed by the natives. The natives obtain rifles illicitly from traders chiefly by the sale of ivory, the ivory trade and the arms traffic being indissolubly connected. In 1902 there were 57, in 1913, 125, in 1914, 92, in 1915, 60, in 1916, 78, and in 1917, 63 tons of ivory exported, principally to Great Britain and the United States. The establishment of merchants and the growing appreciation of money has encouraged the natives to bring in ivory, but much of it is still taken over the frontier.

### *Ostrich Feathers*

The home of the ostrich trade is Kordofan and its centre El-Nahud. The South African are so superior to the Sudan feathers as to make the trade insufficiently remunerative, while the prohibition of the export of ostriches from those parts of Africa where the best feathers are produced prevents the improvement of the Sudan ostrich. The industry would prosper better if the natives would keep the birds under more favourable conditions and the feathers were better sorted by exporters. The quantity of ostrich feathers exported in 1913 was 4,944 kilos.

### *Rubber*

This is a product of the Bahr el-Ghazal, southern Kordofan, and Mongalla.

A good deal of attention has been paid to the question of the cultivation of rubber in the Sudan. The Ceara (*Manihot glazovii*) is regarded as the exotic rubber plant most likely to succeed. In 1908 experimental plantations of various species of rubber were started at various points along the White Nile and Bahr el-Jebel, also at Wau, but were unsuccessful. In 1911 certain rubber-producing areas in the Bahr el-Ghazal were leased to the Kordofan Trading Company for a term of fourteen years. The length of rotation fixed was ten years, giving each separate area nine years' rest. The vines were to

be coppiced and the rubber extracted from the bark by machinery. It was reported in October 1918 that the concession had found the undertaking unprofitable, and that the Government had given authority to the natives to collect and sell the rubber. To encourage the natives the Government had reduced the royalty to  $2\frac{1}{2}$  milliemes per rotl.

The possibilities of the Bahr el-Ghazal Province as regards rubber are still practically untested. Wild rubber is plentiful throughout the central district, and quantities of the vines are found in the eastern, southern, and western districts, but extraction and collection is difficult, and though the vine rubber compares very favourably with plantation rubber, it remains to be shown whether it can compete with plantation rubber as regards cost of production.

In 1913 there were over 85,000 young Ceara trees at Saoleil on the Upper Blue Nile, but the trees had been much damaged by storms and pests. A rubber factory was established at Limbo, near Wau, by the Vines and General Rubber Trust, under the Kordofan Trading Company, and was said to be making good progress. Kagelu on the Lado became a rubber plantation in 1915 (see Appendix V).

### *Fuel and Timber*

While awaiting the problematical discovery of oil, the question of fuel presses for solution. For the time being the forests on the banks of the White and Blue Nile supply the steamers with fuel, but the forests are being exhausted with increasing rapidity. It was hoped that the problem might be solved by the invention of a process for manufacturing combustible briquettes from the sudd. The density and the heat-producing power of samples of these briquettes were said to equal respectively four-fifths and two-thirds those of coal, but the attempt to manufacture on a commercial scale ended in failure owing to remoteness of the sudd area, difficulty of collection of the raw material, and high cost of transport of the briquettes to the places of consumption.

The small stunted trees which form the bulk of the forests

in northern and central Kordofan are of considerable local importance. In addition to supplying fuel they provide materials for native houses and rope making, while many species afford excellent grazing for camels. The southern forests west of the White Nile possess several species of trees of large dimensions, such as the Sudan cedar (*Soymida roupalifolia duruba*), which attains a girth of 4 ft. 6 in. Such large trees provide excellent timber. The forests are, however, hardly explored and totally unexploited. The trees in the Bahr el-Ghazal Province are, as a rule, stunted, crooked, hollow, or generally mis-shapen, and protection against fire would be required to obtain better-grown timber. There are, however, a few gigantic trees which have survived the fires and which would yield timber of large dimensions. The most common is, perhaps, *Khaya senegalensis* (Arab. Homra), a tree of the Memiaceae, to which mahogany and satinwood belong, and which generally yields handsome or useful timber. Bamboo is not found in sufficient quantities to form an article of export. 'Rattan' is found near Tembura. (For further information about the timber resources of the Sudan see under 'Vegetation', p. 101.)

#### *Tannin*

In the Bahr el-Ghazal there are many trees yielding tannin, which may one day be a valuable asset, notably the Abu Surug (*Prosopis oblonga*) and Mudus (*Parkia filicordea*), the barks of which command a good price at Omdurman. The principal tanning material is the pod of the Sunt (*Acacia arabica*), common in central and northern Sudan.

#### *Bees-wax and Honey*

Bees-wax is exported in small but increasing quantities from the Yei district. Bees are common in the Bahr el-Ghazal and the southern provinces, and a considerable amount of honey is taken annually.

#### *Hides and Skins*

There is a large and growing export trade in hides and skins, which is capable of great normal expansion, and which

attained remarkable dimensions during the war. (See Trade.) They are obtained from all the cattle-producing country south of Khartoum.

### *Fibres*

The Ushur has a fibre of potential value, but no means of extracting it in marketable form has been as yet discovered. The *Hibiscus cannabinus* from Bahr el-Ghazal is said to be better than the Indian fibre of the same name. It resembles Indian jute. The *Sansevieria guineensis*, widely distributed in Bahr el-Ghazal, would, if properly prepared, find a ready market. Large quantities of Za'af or Dom palm fibre are collected in Sennar forests and exported for the manufacture of rope. In Sennar there are hemp, flax, jute, hibiscus. Jute about equal to Indian jute of 'extra fine' quality has been grown experimentally at Kodok. Wild jute is found in Upper Nile. The Sudan is very rich in fibre-producing plants, but practically nothing has yet been done to develop this asset.

### MINERAL DEPOSITS

*Coal.*—Impure lignite of rather poor quality has been discovered in Dongola very near the surface of the ground. The geology of the district does not point to there being any workable deposits here. Coal of good quality is known to exist at several places in Abyssinia, the nearest site to the Sudan frontier being Chelga, north of lake Tsana, near Gallabat. So far as the geology of the Sudan is known with certainty, there is little chance of finding large coal deposits.

*Copper.*—The most important deposit in the Sudan is the copper ore of Hofrat-el-Nahas. The mines lie about one mile west of the River Umbelasher, a tributary of the Bahr el-Arab, and consist of a large number of shallow pits covering an area of about half a square mile. In places the ore projects in ridges above the surface. Natives had probably worked the deposits for centuries, and copper, in the form of rings weighing

from ten to twelve pounds, or in small ingots, was an article of barter in Darfur and western Kordofan. According to Russegger the copper was found in the native state in small granules ; otherwise he was unable to account for the purity of the metal, since the crude methods of native smelting were, in his opinion, incapable of refining it. Samples of ore collected about 1911 were silicate and carbonate of poor quality generally, but selected specimens brought in by Colonel Sparkes in 1903 assayed 14 per cent. of pure copper. During the Mahdist revolt the workings were abandoned. Colonel Sparkes, the first European to visit the locality since Purdy's expedition in 1876, found no natives living within thirty miles, but traces of a former large population. He described the country as quite abandoned ; and it was evident that in the event of the mines, which were far from being worked out, being restarted, transport would be a matter of great difficulty, though possible apparently on the Bahr el-Arab during some parts of the year.

*Gold.*—For thousands of years the Sudan was famous for its gold. The mines in the Atbai and Dongola were worked to a great extent when labour was cheap, the metal worth more than at the present time, and possibly the climatic conditions different. The rainfall in the northern part of the Sudan was probably far greater when the mines were originally worked ; not only are there many wells now dry, but traces of reservoirs and even of cultivation are found where the maximum water supply of the year is only one or two rain-storms.

Mines, mining concessions, and prospecting licences are now dealt with by the department of lands.

Um Nabardi mine, near No. 6 station on the Haifa–Abu Hamed line, closed down in September 1919, was the principal place in the Sudan where reef gold was being produced. During 1911, 7,973 oz. of gold were extracted, from 14,707 tons of quartz crushed, and realized the net sum of £E28,268 10s. 8d. During the fourteen months ending October 31, 1913, about 20,000 tons of ore were treated,

and yielded 13,730½ oz. of gold, of the value of £E45,516. In 1914 the yield was worth £E49,898.

In 1913 the gold mine at Gabait, in Red Sea Province, was reopened after a lapse of seven years, by a syndicate, with satisfactory results, the yield being worth £18,404.

The alluvial deposits of the Fazogli district have been worked continuously for many centuries. No figures are available, but it is unlikely that more than two hundred ounces of gold dust are produced annually, all of which apparently finds its way into the hands of native jewellers. Rings of very pure gold from Fazogli are nearly always on sale in Omdurman. Many ancient gold mines in the Red Sea hills have been prospected by mining engineers, but have not attracted them.

The alluvial deposits of Tira-Mandi were abandoned from the time of the Mahdist revolt until about 1908, when it was reported that a few Nubas had restarted work at the principal deposit during the height of the rainy season. The Tira-Mandi deposits are small, and were probably never very rich.

*Graphite.*—Graphite is reported to exist in the Bongo river district of the Bahr el-Ghazal Province; but specimens for verification are lacking. Samples of impure graphite from the Yambio-Meridi road, in the southern Bahr el-Ghazal, have been received in Khartoum.

*Iron.*—The iron-ore deposits of the Sudan consist of :

1. Solid Deposits. The Tokar district has yielded samples of massive specular iron ore; but the precise locality is unknown. Large masses of iron ore are known to exist in the Bahr el-Ghazal and Upper Nile Provinces, but no information can be traced. Among the Nubian sandstone series highly ferruginous beds occur. The most important hitherto found is near Wadi Halfa. It is said to exist in the form of lenticular deposits, 2 to 5 miles in length, and generally of a strongly oolitic nature. A bed of highly ferriferous sandstone is reported as underlying a great mass of intrusive basalt or dolerite in Jebel Alarambia near Kerma.

2. Surface Deposits. In the moist regions of the Bahr

el-Ghazal, Mongalla, and Upper Nile Provinces, the rocks are generally covered by a ferruginous conglomerate associated with a lateritic formation. The rivers and streams expose it admirably, and in places between Rumbek and Mvolo, for instance, the thickness is as much as 50 ft. Usually the surface consists of red loamy soil strewn with box-shaped boulders of different sizes, and supporting a dense growth of forest and grass. In places, however, the ferruginous conglomerate forms isolated patches of large area in the forest, so free of soil that only a scanty supply of short grass succeeds in growing. In the Bahr el-Ghazal Province alone the iron ores cover an area of about 300,000 square miles. The thickness varies from 3 to 15 ft., and may be much more in places. The blackening of rocks is a peculiar feature of the conditions obtaining in the arid regions of the northern Sudan. It appears to be due to the action of small quantities of water, which bring the iron to the surface in solution and deposit it there on evaporation. In areas formed of Nubian sandstone this action has led to the formation of a crust, seldom more than a few inches in thickness; but it is found over large areas, and may form small accumulations of nodules and fragments around hills. Many travellers have been misled by the appearance of these ferricrete crusts, and have described the rocks as volcanic. The existence of this peculiar surface action renders it difficult to distinguish the interstratified ores from the crust. It is possible, also, that some of the beds are really due to this action affecting certain parts of the sandstone more than others.

In the south and west of the Sudan the natives have for many years smelted iron, utilizing charcoal, and clay furnaces about 3 ft. high with bellows to produce a draught. The iron produced is soft, apparently of very good quality, and natives all over the Sudan are supplied by barter with weapons, tools, and ornaments made from it. The principal tribes at present engaged in smelting and smith work are the Jur around Mvolo, Anuak, on the Sobat, Aliab, on the west bank of the Bahr el-Jebel, and Bongo around the Bahr el-Arab. The

Arabs still smelt iron at El-Nahud in western Kordofan, and at several villages in the east of Darfur, employing a highly-ferruginous clay and sand found in pockets in the red sand of the district, but formerly well-known large works at Um Semeima and Jebel Haraza in Kordofan have been neglected since the Mahdist revolt.

*Lead.*—According to one authority lead is found in Jebel Kutum, or Kutub, north of Kobe in Darfur, but it is reported as difficult to obtain. It was reported in 1911 that this deposit was being worked.

*Gypsum and Alabaster.*—Enormous quantities of this mineral exist upon the Red Sea coast, 40 miles north from Port Sudan. The beds in which the gypsum occurs form hill ranges upon the coastal plain, and the large island of Makawa is composed entirely of such beds. Some of the beds of gypsum are 30 ft. thick, but the clearest, whitest, and purest varieties are not found in these, but in smaller beds from 2 to 10 or 12 ft. thick. There are few good harbours very near the deposits save in Khor Donganab, between Ras Raweiyah and the mainland; and the absence of fresh water on the coastal plain is a disadvantage. Gypsum has also been found at Jebel Abiad, about one hundred miles west from the Nile at Khandak.

*Limestone and Marble.*—Limestone occurs in many places. The deposit at Shereikh is the most important one now being worked. Marble is found at Summit.

*Natron.*—Natron (sodium carbonate) is found in the Bir Natrun. The purest is found in a seam from half an inch to two inches thick just below the surface sand, and the best working is about 2,400 yards west of Jebel Kashaf in this Wadi.

*Salt.*—In the arid regions many of the desert gravels are salt-bearing, and in the Butana, east of the Blue Nile between Rufaa and Khartoum, the natives have for many years made a living by the extraction of salt from the surface gravels. Anywhere north of Khartoum, however, salt is extracted wherever these gravels are found, and impure, yellow-coloured salt of local manufacture is sold in nearly every market town.



Many of the natives seem to prefer it to the purer varieties that are imported into the country. The most important localities where salt occurs in beds of considerable size are the Selima Oasis and the lagoons of the Red Sea shore. The Ras Raweiya lagoon, where a very large supply used to be obtained is now being worked by a new concessionaire since 1913. Between June and September, 3,291 tons were forwarded to Port Sudan.

The demand for salt in the Sudan amounts to about 5,000 tons per annum, and after satisfying this demand Raweiya fields are able to export a considerable quantity, mainly to Gambeila, this export now amounting to about 1,000 tons per annum.

In different parts of Kordofan there are deposits of earth from which salt is collected in various ways. At Shershar and El-Gar deep wells are dug and salt extracted by evaporating the water. Darfur is said by the natives and many travellers to be particularly rich in minerals, but the present information is unsatisfactory.

*Mica Deposits.*—Mica deposits exist at Langairio in southern Mongalla.

### *Oil*

Attention is now being paid to the sedimentary deposits on the Red Sea coast, in the hope that in depth they may prove oil-bearing.

### PEARL-SHELL FISHING

Pearl-shell fishing is carried on by the natives off the Red Sea coast. In 1904 the government began to make investigations for the purpose of developing the pearl-shell industry and exploiting it commercially. This industry was brought under a measure of supervision, and in 1911 was held to have made progress justifying expenditure. Pearls are extremely rare, but good specimens are found occasionally. Experimental work on the pearl-shell fishery is still carried on. It had been very much hampered by war conditions.

Three species of *Margaritifera* are found in the Red Sea, two of which are of commercial value, viz. the mother-of-pearl shell, *M. margaritifera* (Arab. *Sadaf*) and *M. vulgaris* (Arab. *Bilbil*). The only fishery of any value is that of the first named. The shell is of fair size, an average weight for a pair of full grown shells being 300–400 grams. The quantity fished annually can hardly be estimated. The records of the Sudan Customs show the following values exported :

	£E.	
1912	2,475,	practically all exported to Great Britain.
1913	15,369,	" " "
1914	2,304,	" " "
1915	3,580,	" " India and Aden.
1916	11,012,	" " India, Egypt, and Eritrea.
1917	4,051,	all exported to Eritrea.

#### LIVE-STOCK

The Sudan has large supplies of cattle and sheep, in which a large export trade was developed during the War. The Egyptian market provided a good opening for trade. Over 20,000 cattle were sent thither in 1915, and more than 87,000 sheep and goats. The total number of cattle exported between January and October 1918 amounted to 31,782 head, and of sheep to 151,712 head, as compared with 18,518 and 101,597 during the corresponding period in 1917. In 1918–19 the quarantine stations passed 25,888 cattle and 179,021 sheep for export. Before the War the trade was much retarded by serious recurrence of cattle-plague. Disease still occurs, but the strengthening of the veterinary department keeps it under effective control. Almost every province is capable of a considerable export except Dongola and Halfa, where there is no natural grazing, or such provinces as Mongalla and Bahr el-Ghazal, where the expense of transport at present hinders the development of the trade. The principal diseases are trypanosomiasis, epizootic lymphangitis, and pleuro-pneumonia.

Natives were extremely reluctant at first to sell their cattle

yield of all the products in quantity (the figures are not available), merely shows the source and value of the revenue obtained from forest produce during the year ending September 30, 1913 :

### *Gum*

The Sudan and Senegal are the two great gum-producing countries of the world. In general it is considered that the Kordofan gum is the more uniform in composition, and that the Senegal trade gums have a marked proportion of weaker varieties. Gum is normally the largest export of the Sudan, and the natives take an increasing share and interest in its collection. In 1912 the output, 19,615 tons, was the highest recorded, the increase being mainly due to the extension of the railway to El-Obeid, which made the gum districts more accessible. In 1913, 15,129 tons (value £E371,528), in 1914, 12,372 tons (value £E314,919), and in 1917, 16,613 tons (value £E744,345) were exported. The forests belong to the Government.

Gum which is not a cultivated product is obtained almost entirely from the *Acacia verec*, from which is drawn the two qualities of gum known as *Hashab Kordofan* and *Hashab Gedaref*. The gum called *Talha* is produced by the *Acacia seyal*, which grows in great abundance in the Upper Blue Nile, but is not exploited, owing to want of means of transport, water and stores, and the small demand for this kind of gum. The report of 1907 on Tartar (*Stercutia cinerea*) from Sennar was very favourable, but it has not yet been exploited. The Sudan contains numerous other gum-yielding trees, including the *Acacia arabica*, but there is at present no demand for the gum obtainable from them. The department of forests has in hand various measures for the maintenance and improvement of the output of gum, especially in Kordofan Province, whence most of the Hashab gum is obtained, the Forest Ordinance conferring on it extensive powers for the improvement of transport and the preservation and sale of the crop.

Province.	Timber.	Firewood collected through department.	Firewood collected through province.	Rubber.	Gum.	Other forest produce.	Total.
	£E.	£E.	£E.	£E.	£E.	£E.	£E.
Bahr el-Ghazal	.	1,740	126	133	—	—	2,109
Berber .	.	712	158	—	—	607	1,537
Blue Nile	.	939	192	—	—	?	1,176
Kassala	.	206	70	—	3,066	?	3,362
Khartoum	.	—	291	—	—	56	347
Kordofan	.	—	166	—	52,983	?	53,149
Mongalla	.	3,271	?	?	—	—	3,271
Red Sea	.	—	460	—	—	230	690
Sennar .	.	325	28	—	4,698	35	5,139
Upper Nile	.	8,575	3	—	815	10	9,438
White Nile	.	6,809	72	—	5,086	• 12	12,019
Total	.	22,577	1,566	133	66,648	950 <sup>1</sup>	92,237

<sup>1</sup> Most of these figures have been obtained from the Customs Department returns.

The principal gum regions are the forests of Kordofan. Certain parts here have been worked out, but enormous gum areas remain. Where the gum-belt approaches the White Nile the country consists of a dead flat plain of hard clay, on the surface of which rest numerous sand ridges upon which the gum is produced. The succession of crops, fallow, and gum 'gardens' really form a slow rotation of crops in Kordofan, where the soil soon becomes exhausted under any one crop. New areas have been and are being opened in other parts of the Sudan, notably in Kassala (Gedaref and Mafaza) and Upper Nile Province, and in Sennar, where there is a large expanse of hashab forest practically untapped in 1913. There are large areas both of hashab and talha in the districts of Singa, Karkoj, Dinder, and Roseires.

The method of extraction is simple: In January strips of bark are torn from the trees, dead branches cut away, and in well-managed gum 'gardens' the grass is cut as a protection from forest fires. When the hot weather comes the sap oozes out of the wound and is collected every few days. When the rains begin the flow of the gum ceases.

An important element in securing a good price in European markets is the cleanness of the gum.

Kordofan gum, though all collected from the *Acacia verec*, has different varieties. The 'hard' variety, known as 'Khartoum', is collected from young trees and used for dyeing and finishing silk and other fabrics. The 'soft' grade, known as 'Kordofan', is the product of more fully matured trees and is used for confectionery and pharmaceutical products. Lower grades are used in the manufacture of inks, matches, stationery, &c.

A summary of the production of gum in 1913 is given on p. 401.

### *Ivory*

The ivory trade is connected with Upper Nile, Mongalla, Kordofan, and Bahr el-Ghazal, but elephants are now almost extinct in southern and south-western Kordofan. The trade

<i>Departments and provinces.</i>	<i>Hashab.</i>		<i>Gezira.</i>		<i>Talh.</i>		<i>Total.</i>	
	<i>Kantars.</i>	<i>Rolls.</i>	<i>Kantars.</i>	<i>Rolls.</i>	<i>Kantars.</i>	<i>Rolls.</i>	<i>Kantars.</i>	<i>Rolls.</i>
Sudan Customs <sup>1</sup>	23	55	3	16	6	75	53	46
Kassala	13,615	10	—	—	527	45	14,142	55
Kordofan.	240,833	67	—	—	—	—	240,833	67
Sennar	12,001	37	—	—	18,706	85	30,708	22
White Nile	23,075	51	—	—	83	56	23,159	7
Upper Nile	503	49	—	—	6,401	52	6,905	1
Total	290,052	69	3	16	25,726	13	315,781	98

<sup>1</sup> These figures represent gum of which the province of origin is unknown.

## AGRICULTURAL PRODUCTS

*Dura*

*Dura* (*Sorghum vulgare*) is practically a universal crop, about 61·7 per cent. of the total cultivated area, especially plentiful in Berber, Khartoum, the Gezira districts, Kassala, and the Nuba mountains. The Gezira is the granary of the Sudan. There are often two crops, an early one sown in June or July, known as Naggad, and a later crop sown in September or October. The time of sowing depends on the district and variety. An average period for early maturing duras on rain land is 90–95 days, but, if hastened, a fair yield can be got in 70–75 days. On heavy rain land 110–120 days are required, and late-sown duras, e.g. in the Gash delta, require 130–145 days. In good rain years large crops are cultivated, and the grain, which is the principal food grain of the country, is available for export in quantity; in bad years Indian dura has to be imported, sometimes in large quantities. In 1903, 531,876 and in 1913, 1,393,344 feddans were under dura. In 1917 the quantity of dura exported was 84,779; in 1918, 54,945; in 1919, 1,656 tons.

The production of this commodity is incidentally one of the principal causes of the labour difficulty; being economical and nourishing it allows the Sudanese to live almost for nothing, as land is cheap and the grain is grown with little labour. Its albuminoid nutrient ratio is higher than that of wheat, and its fat content is especially high, being 3·3 per cent., as against 1·2 per cent. in wheat. It is either baked into flat wafers (*kisra*), or boiled (*asida*), and is also made into a sweet beer (*merissa* or *Um Bilbil*). As food for animals dura is believed to be less heating than dukhn. Dura stalks (*gasab*) are a valuable forage.

Feterita (which can be kept stored in large bulk in grain pits for several years) is the variety most grown in the Gezira; it is very nutritious and good for cattle.

Sudan dura is a satisfactory feeding-stuff for pigs and poultry, about equal in value to maize. It could probably

be substituted for maize in the manufacture of certain kinds of spirits. In the brewing industry, and in the manufacture of starch and glucose, the use of dura instead of maize presents certain technical difficulties which could probably be overcome.

During the war dura flour was used in the Sudan to dilute wheat flour owing to scarcity of the latter.

### *Dukhn*

Dukhn (*Pennisetum typhoidum*), bullrush or spiked millet, requires less water than dura, has a shorter period of growth, and will grow on poorer soil. It occupies 25 per cent. of the whole cultivated area. It is largely grown in Kordofan (the dukhn of which is famous) and in many other parts of the country. In 1903 there were 25,571, and in 1913, 567,194 feddans under dukhn. It is largely used as human food in the Western Sudan.

### *Maize*

Maize (*Zea Mais*) is chiefly grown along the banks of the Blue Nile in Sennar Province, to some extent in the heavier rain land, and in the northern provinces under artificial irrigation and on the river banks. The period of growth is 100–20 days, the time being somewhat prolonged under artificial irrigation. There were in 1903, 10,632, and in 1913, 23,806 feddans under maize.

Sudan maize compares favourably with South African 'Hickory King' and surpasses it in the percentage of protein present. The percentage of oil (ether extract) is high. Like South African maize, it has the advantage over North and South American maize of being much drier, and consequently better suited for transport. Such faults as it has could be remedied by planting only the whitest kernels.

### *Wheat*

Wheat growing has increased steadily in recent years, but its area is still small in comparison with dura. There were in



1903, 16,057 feddans under wheat, in 1910, 19,681, in 1911, 26,972, in 1912, 29,193, in 1913, 30,039, and in 1917 there were some 40,000 acres ; while 1918 saw a still further extension.

The wheat is grown almost entirely under irrigation, artificial or flood ; it was grown as a rain crop on only 176 feddans in 1910, on 20 in 1912. At present wheat is cultivated chiefly in Halfa, Dongola, Berber, and Khartoum Provinces.

As a war measure, to supplement the food supply of Egypt and the Sudan, an area of 15,000–20,000 feddans was put under cultivation in Berber and Dongola provinces by means of pumps driven by oil engines. Wheat was to be the principal crop on these pumping stations.

The Central Research Farm at Khartoum North supplies water to natives for wheat cultivation.

Wheat is grown on the ' Basins ' in Dongola Province. Parts of western Kordofan and Darfur are also suitable for wheat production. Good crops can be grown in the Gezira. Winter crops are sown from the beginning of November to December. Wheat takes 130–50 days to mature.

At the present time the production does not meet local requirements, and considerable quantities of wheat and flour are imported, the statistics for recent years giving the value of such imports as ££4,358 for 1911, ££23,009 for 1912, and ££15,654 for 1913. In 1914 it rose to ££39,466. In 1917 it had fallen to ££5,391. The samples of wheat grown under irrigation at the Gezira Agricultural Experimental Station which were examined at the Imperial Institute in 1913 were on the whole like good average Indian wheats. The ' Dongola ' wheat yielded the best flour.

### *Barley*

Barley is grown mainly in the northern provinces under artificial irrigation, and a certain amount under flood irrigation and on the river banks. As a winter crop it is sown from the beginning of November to the middle of December, and takes 110–20 days to mature. There were in 1903, 11,541, and in 1913, 8,942 feddans under barley.

*Rice and Tapioca*

Rice and tapioca were reported in 1906 as grown successfully in the Bahr el-Ghazal. Successful experiments in the cultivation of hill rice were made at Meridi in 1913. Similar attempts are now being made at Wau and Lau.

*Manioc*

Manioc, called by the Zande *Buфра*, is largely cultivated by them in the southern Bahr el-Ghazal. Its flour is considered greatly superior to that of *dura*. It is eaten in the form of a paste and closely resembles tapioca.

*Coffee*

Coffee of promising quality was, in 1915, found growing wild in the Kaji Kaji district of Mongalla. The Yei district of Mongalla Province appears to be well suited for coffee growing and experiments are being carried out at the Government Farm at Kagalu where European and Indian fruits are also being grown successfully. It is possible that coffee could be grown in the Red Sea hills.

*Castor*

An excellent variety of castor-oil seed (*Ricinus communis*) grows wild in Kordofan. It is also found in the Upper Nile Province, and in many other parts of the country, but is not exported in any large quantity. It is cultivated on the river banks in Halfa Province.

*Sesame*

Sesame (*Sesamum orientale*, *simsim*) is grown chiefly on rain land, and mainly in Sennar, White Nile, Kassala, and Kordofan. It is sown in July, and the period of growth is 110-20 days. After *dura* and *dukhn* this yields the most plentiful crop. Sesame yields a valuable oil (some seeds contain 50 per cent. oil) employed in the Sudan as an article of food, and in Europe in soap making and the preparation

of edible oils and fats. In good years large quantities are exported. In 1903 there were 14,230, and in 1913, 118,398 feddans under sesame.

### *Senat*

Senat (*Cucumis melo* var. *agrestis*), common in the natural state, is not extensively cultivated. The seed contains 37 per cent. oil. If exported it would certainly find a market. It can be grown practically anywhere in the central and southern Sudan.

### *Earthnuts*

Earthnuts (*Arachis hypogaea*) are grown on certain favourable rain lands in Kordofan, Upper Nile, White Nile, and Dar Nuba, also under flood and artificial irrigation in Blue Nile, Khartoum, and elsewhere. Sown in July or August, the period of growth is 5½–6 months. Considerable quantities are exported. There were in 1906, 623, and in 1913, 18,224 feddans under earthnuts.

### *Lubia*

Lubia (*Dolichus lablab*) is widely grown under flood or artificial irrigation. During growth the leaves, and later the beans, are used as vegetables by the natives. It is a valuable fodder crop. It may be sown at any time of the year, and is used as a renovating crop.

### *Pineapples, Bananas*

Pineapples have been grown successfully at Meridi in the Bahr el-Ghazal. Bananas are indigenous in the three southern districts of the Bahr el-Ghazal, where they form a zareba round the native huts.

### *Water Melons*

Vast areas of water melons are cultivated in Kordofan to eke out the scanty water supply particularly for gum pickers. The seeds yield a useful edible oil and are exported in small quantities.

*Dates*

Dates are extensively grown, especially in Dongola, Berber, Halfa, and Kordofan. The dates as a whole are of the 'dry' kind, not regarded as the best for overseas export. Certain varieties, e. g. 'Bertamoda' and 'Gondeila' can be made 'soft' and remain so for long periods. In Berber special efforts have been made to encourage production by shoots from Halfa and elsewhere. Good Halfa dates are good quality ordinary dates, to be classed with Persian dates. Algerian dates, Deglet el-Nur, have been successfully introduced into Dongola province.

*Tobacco*

Tobacco is grown in considerable quantities in the Nuba Mountains and to some extent in the southern Bahr el-Ghazal and other parts of the southern Sudan. It has an unpleasant flavour owing to the admixture of wood ashes. There is a great demand for this tobacco among the Dinka. The best varieties are grown at Jebel Nyima and Jebel Tira el-Akhdar and in Darfur. The cultivation of tobacco for export is prohibited in accordance with the agreement between Egypt and foreign powers.

*Vegetables*

Bamia (lady's finger, *Hibiscus esculentus*) is grown on the islands of the Nile, on the river bank in the White Nile Province, and also in Kordofan and the Bahr el-Ghazal. Onions (*basal*) are greatly in demand, and there is a considerable increase in their cultivation by the Nuba. Large quantities are grown in the White Nile and Kordofan. In 1903 there were 100, and in 1913, 3,799 feddans under onions. Sweet potatoes are grown in the southern Bahr el-Ghazal. European vegetables are only cultivated at a few of the government posts. Tomatoes and beans thrive especially well. Potatoes, peas, carrots, and turnips do excellently; cauliflowers and cabbages are less satisfactory.

*Minor crops*

There were in 1906, 36, in 1912, 325, and in 1913, 59 feddans under sugar cane. Other minor crops are : lupine (*Lupinus albus*), pigeon pea (*Cajanus indicus*), safflower (*Carthamus tinctorius*).

*Cotton*

The question of cotton is of great importance to the Sudan. In 1903 there were 47,418, and in 1913 only 37,771 feddans under cotton. This was the least satisfactory of any of the crop returns for 1912-13, and was largely brought about by the diminished flooding at Tokar. Nevertheless it is possible that cotton may become the chief export crop, and the development of its cultivation the surest way of providing for the economic future of the Sudan. The quantity of ginned cotton exported in 1913 was 2,315 tons, in 1914 1,712 tons. In 1915 the export was 4,305 tons, in 1916 2,941 tons, and in 1917 4,168 tons.

Cotton is grown under flood and artificial irrigation. Egyptian varieties of good quality are grown in the Khartoum and Berber Provinces and in the Gezira under pump irrigation ; also in the eastern Sudan on the deltas of the Baraka and Gash under flood irrigation. On these deltas, especially the Baraka, the climate is very suitable for Egyptian varieties. In the Khartoum and Berber Provinces the climate is less suitable for the growth of Egyptian varieties, and in recent years the tendency has been to introduce the long-stapled American varieties which mature more quickly. As regards the Tokar (Baraka) crop, there has been a tendency in recent years to consider American cotton as superior to Egyptian for Sudan purposes. But the matter cannot be regarded as finally determined, and any wholesale substitution of American for Egyptian varieties must only be made after the most careful and exhaustive experiment. Of the Egyptian varieties Mitafifi proved (1910-11) superior to Abassi, and, though the latter gave a better lint, it was considered that the

former would prove the more suitable for cultivation in Tokar. The American cotton gave a yield one-half to three-quarters as much again as Mitafifi on moderately irrigated land, and the difference in favour of the former increases the lighter the irrigation. The Mitafifi cotton gave a higher percentage of lint and cost less to gin.

The period of growth of American cotton is about 30 days earlier ; it gives a big flush of cotton early in the season, has a lower and sturdier habit of growth, and is therefore less readily damaged by wind ; it is more easily picked and requires less irrigation. In 1913 the shorter stapled and earlier maturing American kinds gave the better results in Berber province, the Egyptian kinds being disappointing. The Tokar cotton fetched prices equivalent to the best Upper Egyptian varieties till the end of May, when, owing to climatic conditions, Tokar cotton deteriorates.

The disadvantage of American cotton is that ordinary qualities meet very great competition from other cotton countries. At Tayiba and Barakat test stations, several thousand feddans in extent, for the Gezira irrigation scheme, Egyptian varieties of good quality have been successfully grown. A native variety is grown in certain localities. This is quickly maturing, hardy cotton, of short staple and poor quality. It is generally consumed locally, being woven into the native cloth called *damur*.

The time of sowing varies with the locality and the variety grown. On the Baraka and Gash deltas Egyptian cotton is sown in August and September, and picked in February, March, April, and May. In the Khartoum and Berber Provinces under pump irrigation May and June are considered the best months for sowing Egyptian cotton, and picking takes place in December, January, and February. In the Gezira Egyptian cotton under pump irrigation is sown in July and August and picked in January, February, and March.

The monthly report of the Sudan Government Central Economic Board for July 1918 stated that the total of the

year's cotton crop for that year was estimated at 8,300 kantars of 315 rattles, unginned; this was 5,000 kantars below the estimate of the probable crop made in January.

At least 3,300 kantars of the deficit were due to the fact that a large quantity of the cotton, as soon as it was ripe, was allowed to fall to the ground and become so covered with dust and sand as to be quite useless for sale.

A severe outbreak of 'Asal' which attacked the later grown cotton accounted for the remainder of the deficit.

Considerable difficulty had been experienced in obtaining sufficient camels to transport the ginned cotton to Atbara and Suakin.

Cotton seed was being issued sufficient for a crop of 10,000 kantars of 315 rattles only in 1919, as this was probably the maximum which could be dealt with owing to the shortage of camels.

The output of cotton at Tokar for 1907-16 is shown in the following table :

<i>Season.</i>	<i>Tons.</i>	<i>Seed Cotton. Prices per ton.</i>			<i>Total value. £</i>	<i>Ginned Cotton. No. of Bales.<sup>1</sup></i>
		<i>£</i>	<i>s.</i>	<i>d.</i>		
1907-8	3,981	12	9	0	49,563	7,022
1908-9	2,343	19	10	3	45,718	4,133
1909-10	4,361	34	10	0	150,454	7,693
1910-11	6,912	21	19	6	151,891	12,193
1911-12	4,982	19	2	10	95,364	8,788
1912-13	5,077	23	7	2	118,590	8,957
1913-14	2,936	20	15	8	61,020	5,168
1914-15	9,035	12	15	8	115,497	15,973
1915-16	5,692	20	11	0	116,970	10,060

The report of the Sudan Plantations Syndicate for the year ending June 1917 stated that the issued share capital remained at £135,000, and the debenture capital at £57,000. The crops from the three stations handled at the ginning factories in 1916-17 were as follows :

		<i>Bales.</i>	
		<i>1916.</i>	<i>1917.</i>
Barakat	.	1,687	1,956
Tayiba	.	1,010	1,432
Zeidab	.	2,080	1,631

<sup>1</sup> One bale weighs 400 lb.

There was a net profit of £14,838 bringing the total credit balance to £24,514.

The following table shows the total export of cotton (in Bales) for 1911-16 and the proportion contributed by Tokar and by other places :

<i>Year.</i>	<i>Total export. Bales.</i>	<i>From Tokar.</i>		<i>From other places.</i>	
		<i>Bales.</i>	<i>Percentage of total.</i>	<i>Bales.</i>	<i>Percentage of total.</i>
1911 .	22,823	12,193	53.4	10,630	46.6
1912 .	15,000	8,788	58.6	6,212	41.4
1913 .	12,830	8,957	69.8	3,873	30.2
1914 .	9,435	5,168	54.8	4,267	45.2
1915 .	23,765	15,937	67	7,828	33
1916 .	16,219	10,061	62	6,158	38

### FOREST PRODUCTS : ANIMAL SPOILS <sup>1</sup>

The total area of reserved forests in 1913 was 207 square miles.

The most important product belonging to this section is gum, and next to it come ivory, feathers, firewood.

The following amounts (in kantars) of gum, ivory, and feathers were exported during the ten years 1905-14 :

<i>Year.</i>	<i>Gum.</i>	<i>Ivory.</i>	<i>Feathers.</i>
1905 . . . .	158,000	1,720	318
1906 . . . .	162,000	1,500	500
1907 . . . .	204,961	1,931	474
1908 . . . .	224,523	1,109	200
1909 . . . .	295,129	1,334	264
1910 . . . .	301,717	1,750	605
1911 . . . .	319,043	2,219	371
1912 . . . .	436,578	2,374	153
1913 . . . .	336,728	2,792	130
1914 . . . .	275,375	2,054	85

The quantity of gum exported in 1914 represented a value of £E314,919, of ivory £E84,605, of feathers £E3,999. In 1917 gum and ivory represented values of £E744,345 and £E57,251 respectively.

The table on p. 399, since it is not possible to give the

<sup>1</sup> See also Appendix V.



yield of all the products in quantity (the figures are not available), merely shows the source and value of the revenue obtained from forest produce during the year ending September 30, 1913 :

### *Gum*

The Sudan and Senegal are the two great gum-producing countries of the world. In general it is considered that the Kordofan gum is the more uniform in composition, and that the Senegal trade gums have a marked proportion of weaker varieties. Gum is normally the largest export of the Sudan, and the natives take an increasing share and interest in its collection. In 1912 the output, 19,615 tons, was the highest recorded, the increase being mainly due to the extension of the railway to El-Obeid, which made the gum districts more accessible. In 1913, 15,129 tons (value £E371,528), in 1914, 12,372 tons (value £E314,919), and in 1917, 16,613 tons (value £E744,345) were exported. The forests belong to the Government.

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Province.	Timber.	Firewood collected through department.	Firewood collected through province.	Rubber.	Gum.	Other forest produce.	Total.
	££.	££.	££.	££.	££.	££.	££.
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Total	.	363	22,577	1,566	66,648	950 <sup>1</sup>	92,237

<sup>1</sup> Most of these figures have been obtained from the Customs Department returns.

The principal gum regions are the forests of Kordofan. Certain parts here have been worked out, but enormous gum areas remain. Where the gum-belt approaches the White Nile the country consists of a dead flat plain of hard clay, on the surface of which rest numerous sand ridges upon which the gum is produced. The succession of crops, fallow, and gum 'gardens' really form a slow rotation of crops in Kordofan, where the soil soon becomes exhausted under any one crop. New areas have been and are being opened in other parts of the Sudan, notably in Kassala (Gedaref and Mafaza) and Upper Nile Province, and in Sennar, where there is a large expanse of hashab forest practically untapped in 1913. There are large areas both of hashab and talha in the districts of Singa, Karkoj, Dinder, and Roseires.

The method of extraction is simple: In January strips of bark are torn from the trees, dead branches cut away, and in well-managed gum 'gardens' the grass is cut as a protection from forest fires. When the hot weather comes the sap oozes out of the wound and is collected every few days. When the rains begin the flow of the gum ceases.

An important element in securing a good price in European markets is the cleanness of the gum.

Kordofan gum, though all collected from the *Acacia verec*, has different varieties. The 'hard' variety, known as 'Khartoum', is collected from young trees and used for dyeing and finishing silk and other fabrics. The 'soft' grade, known as 'Kordofan', is the product of more fully matured trees and is used for confectionery and pharmaceutical products. Lower grades are used in the manufacture of inks, matches, stationery, &c.

A summary of the production of gum in 1913 is given on p. 401.

### *Ivory*

The ivory trade is connected with Upper Nile, Mongalla, Kordofan, and Bahr el-Ghazal, but elephants are now almost extinct in southern and south-western Kordofan. The trade

<i>Departments and provinces.</i>	<i>Hashab.</i>		<i>Gezira.</i>		<i>Talh.</i>		<i>Total.</i>	
	<i>Kantars.</i>	<i>Roils.</i>	<i>Kantars.</i>	<i>Roils.</i>	<i>Kantars.</i>	<i>Roils.</i>	<i>Kantars.</i>	<i>Roils.</i>
Sudan Customs <sup>1</sup>	23	55	3	16	6	75	53	46
Kassala	13,615	10	—	—	527	45	14,142	55
Kordofan.	240,833	67	—	—	—	—	240,833	67
Sennar	12,001	37	—	—	18,706	85	30,708	22
White Nile	23,075	51	—	—	83	56	23,159	7
Upper Nile	503	49	—	—	6,401	52	6,905	1
Total	290,052	69	3	16	25,726	13	315,781	98

<sup>1</sup> These figures represent gum of which the province of origin is unknown.

was steadily increasing until the outbreak of war. In spite of precautions and regulations, it is believed that much wanton slaughter of immature and female elephants is committed by the natives. The natives obtain rifles illicitly from traders chiefly by the sale of ivory, the ivory trade and the arms traffic being indissolubly connected. In 1902 there were 57, in 1913, 125, in 1914, 92, in 1915, 60, in 1916, 78, and in 1917, 63 tons of ivory exported, principally to Great Britain and the United States. The establishment of merchants and the growing appreciation of money has encouraged the natives to bring in ivory, but much of it is still taken over the frontier.

### *Ostrich Feathers*

The home of the ostrich trade is Kordofan and its centre El-Nahud. The South African are so superior to the Sudan feathers as to make the trade insufficiently remunerative, while the prohibition of the export of ostriches from those parts of Africa where the best feathers are produced prevents the improvement of the Sudan ostrich. The industry would prosper better if the natives would keep the birds under more favourable conditions and the feathers were better sorted by exporters. The quantity of ostrich feathers exported in 1913 was 4,944 kilos.

### *Rubber*

This is a product of the Bahr el-Ghazal, southern Kordofan, and Mongalla.

A good deal of attention has been paid to the question of the cultivation of rubber in the Sudan. The Ceara (*Manihot glazovii*) is regarded as the exotic rubber plant most likely to succeed. In 1908 experimental plantations of various species of rubber were started at various points along the White Nile and Bahr el-Jebel, also at Wau, but were unsuccessful. In 1911 certain rubber-producing areas in the Bahr el-Ghazal were leased to the Kordofan Trading Company for a term of fourteen years. The length of rotation fixed was ten years, giving each separate area nine years' rest. The vines were to

be coppiced and the rubber extracted from the bark by machinery. It was reported in October 1918 that the concession had found the undertaking unprofitable, and that the Government had given authority to the natives to collect and sell the rubber. To encourage the natives the Government had reduced the royalty to  $2\frac{1}{2}$  milliemmes per rotl.

The possibilities of the Bahr el-Ghazal Province as regards rubber are still practically untested. Wild rubber is plentiful throughout the central district, and quantities of the vines are found in the eastern, southern, and western districts, but extraction and collection is difficult, and though the vine rubber compares very favourably with plantation rubber, it remains to be shown whether it can compete with plantation rubber as regards cost of production.

In 1913 there were over 85,000 young Ceara trees at Saoleil on the Upper Blue Nile, but the trees had been much damaged by storms and pests. A rubber factory was established at Limbo, near Wau, by the Vines and General Rubber Trust, under the Kordofan Trading Company, and was said to be making good progress. Kagelu on the Lado became a rubber plantation in 1915 (see Appendix V).

### *Fuel and Timber*

While awaiting the problematical discovery of oil, the question of fuel presses for solution. For the time being the forests on the banks of the White and Blue Nile supply the steamers with fuel, but the forests are being exhausted with increasing rapidity. It was hoped that the problem might be solved by the invention of a process for manufacturing combustible briquettes from the sudd. The density and the heat-producing power of samples of these briquettes were said to equal respectively four-fifths and two-thirds those of coal, but the attempt to manufacture on a commercial scale ended in failure owing to remoteness of the sudd area, difficulty of collection of the raw material, and high cost of transport of the briquettes to the places of consumption.

The small stunted trees which form the bulk of the forests

in northern and central Kordofan are of considerable local importance. In addition to supplying fuel they provide materials for native houses and rope making, while many species afford excellent grazing for camels. The southern forests west of the White Nile possess several species of trees of large dimensions, such as the Sudan cedar (*Soymida roupalifolia duruba*), which attains a girth of 4 ft. 6 in. Such large trees provide excellent timber. The forests are, however, hardly explored and totally unexploited. The trees in the Bahr el-Ghazal Province are, as a rule, stunted, crooked, hollow, or generally mis-shapen, and protection against fire would be required to obtain better-grown timber. There are, however, a few gigantic trees which have survived the fires and which would yield timber of large dimensions. The most common is, perhaps, *Khaya senegalensis* (Arab. Homra), a tree of the Memiaceae, to which mahogany and satinwood belong, and which generally yields handsome or useful timber. Bamboo is not found in sufficient quantities to form an article of export. 'Rattan' is found near Tembura. (For further information about the timber resources of the Sudan see under 'Vegetation', p. 101.)

#### *Tannin*

In the Bahr el-Ghazal there are many trees yielding tannin, which may one day be a valuable asset, notably the Abu Surug (*Prosopis oblonga*) and Mudus (*Parkia filicordea*), the barks of which command a good price at Omdurman. The principal tanning material is the pod of the Sunt (*Acacia arabica*), common in central and northern Sudan.

#### *Bees-wax and Honey*

Bees-wax is exported in small but increasing quantities from the Yei district. Bees are common in the Bahr el-Ghazal and the southern provinces, and a considerable amount of honey is taken annually.

#### *Hides and Skins*

There is a large and growing export trade in hides and skins, which is capable of great normal expansion, and which

attained remarkable dimensions during the war. (See Trade.) They are obtained from all the cattle-producing country south of Khartoum.

### *Fibres*

The Ushur has a fibre of potential value, but no means of extracting it in marketable form has been as yet discovered. The *Hibiscus cannabinus* from Bahr el-Ghazal is said to be better than the Indian fibre of the same name. It resembles Indian jute. The *Sansevieria guineensis*, widely distributed in Bahr el-Ghazal, would, if properly prepared, find a ready market. Large quantities of Za'af or Dom palm fibre are collected in Sennar forests and exported for the manufacture of rope. In Sennar there are hemp, flax, jute, hibiscus. Jute about equal to Indian jute of 'extra fine' quality has been grown experimentally at Kodok. Wild jute is found in Upper Nile. The Sudan is very rich in fibre-producing plants, but practically nothing has yet been done to develop this asset.

### MINERAL DEPOSITS

*Coal*.—Impure lignite of rather poor quality has been discovered in Dongola very near the surface of the ground. The geology of the district does not point to there being any workable deposits here. Coal of good quality is known to exist at several places in Abyssinia, the nearest site to the Sudan frontier being Chelga, north of lake Tsana, near Gallabat. So far as the geology of the Sudan is known with certainty, there is little chance of finding large coal deposits.

*Copper*.—The most important deposit in the Sudan is the copper ore of Hofrat-el-Nahas. The mines lie about one mile west of the River Umbelasher, a tributary of the Bahr el-Arab, and consist of a large number of shallow pits covering an area of about half a square mile. In places the ore projects in ridges above the surface. Natives had probably worked the deposits for centuries, and copper, in the form of rings weighing



from ten to twelve pounds, or in small ingots, was an article of barter in Darfur and western Kordofan. According to Russegger the copper was found in the native state in small granules ; otherwise he was unable to account for the purity of the metal, since the crude methods of native smelting were, in his opinion, incapable of refining it. Samples of ore collected about 1911 were silicate and carbonate of poor quality generally, but selected specimens brought in by Colonel Sparkes in 1903 assayed 14 per cent. of pure copper. During the Mahdist revolt the workings were abandoned. Colonel Sparkes, the first European to visit the locality since Purdy's expedition in 1876, found no natives living within thirty miles, but traces of a former large population. He described the country as quite abandoned ; and it was evident that in the event of the mines, which were far from being worked out, being restarted, transport would be a matter of great difficulty, though possible apparently on the Bahr el-Arab during some parts of the year.

*Gold.*—For thousands of years the Sudan was famous for its gold. The mines in the Atbai and Dongola were worked to a great extent when labour was cheap, the metal worth more than at the present time, and possibly the climatic conditions different. The rainfall in the northern part of the Sudan was probably far greater when the mines were originally worked ; not only are there many wells now dry, but traces of reservoirs and even of cultivation are found where the maximum water supply of the year is only one or two rain-storms.

Mines, mining concessions, and prospecting licences are now dealt with by the department of lands.

Um Nabardi mine, near No. 6 station on the Haifa–Abu Hamed line, closed down in September 1919, was the principal place in the Sudan where reef gold was being produced. During 1911, 7,973 oz. of gold were extracted, from 14,707 tons of quartz crushed, and realized the net sum of £E28,268 10s. 8d. During the fourteen months ending October 31, 1913, about 20,000 tons of ore were treated,

and yielded 13,730½ oz. of gold, of the value of £E45,516. In 1914 the yield was worth £E49,898.

In 1913 the gold mine at Gabait, in Red Sea Province, was reopened after a lapse of seven years, by a syndicate, with satisfactory results, the yield being worth £18,404.

The alluvial deposits of the Fazogli district have been worked continuously for many centuries. No figures are available, but it is unlikely that more than two hundred ounces of gold dust are produced annually, all of which apparently finds its way into the hands of native jewellers. Rings of very pure gold from Fazogli are nearly always on sale in Omdurman. Many ancient gold mines in the Red Sea hills have been prospected by mining engineers, but have not attracted them.

The alluvial deposits of Tira-Mandi were abandoned from the time of the Mahdist revolt until about 1908, when it was reported that a few Nubas had restarted work at the principal deposit during the height of the rainy season. The Tira-Mandi deposits are small, and were probably never very rich.

*Graphite.*—Graphite is reported to exist in the Bongo river district of the Bahr el-Ghazal Province; but specimens for verification are lacking. Samples of impure graphite from the Yambio-Meridi road, in the southern Bahr el-Ghazal, have been received in Khartoum.

*Iron.*—The iron-ore deposits of the Sudan consist of :

1. Solid Deposits. The Tokar district has yielded samples of massive specular iron ore; but the precise locality is unknown. Large masses of iron ore are known to exist in the Bahr el-Ghazal and Upper Nile Provinces, but no information can be traced. Among the Nubian sandstone series highly ferruginous beds occur. The most important hitherto found is near Wadi Halfa. It is said to exist in the form of lenticular deposits, 2 to 5 miles in length, and generally of a strongly oolitic nature. A bed of highly ferriferous sandstone is reported as underlying a great mass of intrusive basalt or dolerite in Jebel Alarambia near Kerma.

2. Surface Deposits. In the moist regions of the Bahr

el-Ghazal, Mongalla, and Upper Nile Provinces the rocks are generally covered by a ferruginous conglomerate associated with a lateritic formation. The rivers and streams expose it admirably, and in places between Rumbek and Mvolo, for instance, the thickness is as much as 50 ft. Usually the surface consists of red loamy soil strewn with box-shaped boulders of different sizes, and supporting a dense growth of forest and grass. In places, however, the ferruginous conglomerate forms isolated patches of large area in the forest, so free of soil that only a scanty supply of short grass succeeds in growing. In the Bahr el-Ghazal Province alone the iron ores cover an area of about 300,000 square miles. The thickness varies from 3 to 15 ft., and may be much more in places. The blackening of rocks is a peculiar feature of the conditions obtaining in the arid regions of the northern Sudan. It appears to be due to the action of small quantities of water, which bring the iron to the surface in solution and deposit it there on evaporation. In areas formed of Nubian sandstone this action has led to the formation of a crust, seldom more than a few inches in thickness; but it is found over large areas, and may form small accumulations of nodules and fragments around hills. Many travellers have been misled by the appearance of these ferricrete crusts, and have described the rocks as volcanic. The existence of this peculiar surface action renders it difficult to distinguish the interstratified ores from the crust. It is possible, also, that some of the beds are really due to this action affecting certain parts of the sandstone more than others.

In the south and west of the Sudan the natives have for many years smelted iron, utilizing charcoal, and clay furnaces about 3 ft. high with bellows to produce a draught. The iron produced is soft, apparently of very good quality, and natives all over the Sudan are supplied by barter with weapons, tools, and ornaments made from it. The principal tribes at present engaged in smelting and smith work are the Jur around Mvolo, Anuak, on the Sobat, Aliab, on the west bank of the Bahr el-Jebel, and Bongo around the Bahr el-Arab. The

Arabs still smelt iron at El-Nahud in western Kordofan, and at several villages in the east of Darfur, employing a highly-ferruginous clay and sand found in pockets in the red sand of the district, but formerly well-known large works at Um Semeima and Jebel Haraza in Kordofan have been neglected since the Mahdist revolt.

*Lead.*—According to one authority lead is found in Jebel Kutum, or Kutub, north of Kobe in Darfur, but it is reported as difficult to obtain. It was reported in 1911 that this deposit was being worked.

*Gypsum and Alabaster.*—Enormous quantities of this mineral exist upon the Red Sea coast, 40 miles north from Port Sudan. The beds in which the gypsum occurs form hill ranges upon the coastal plain, and the large island of Makawa is composed entirely of such beds. Some of the beds of gypsum are 30 ft. thick, but the clearest, whitest, and purest varieties are not found in these, but in smaller beds from 2 to 10 or 12 ft. thick. There are few good harbours very near the deposits save in Khor Donganab, between Ras Raweiya and the mainland; and the absence of fresh water on the coastal plain is a disadvantage. Gypsum has also been found at Jebel Abiad, about one hundred miles west from the Nile at Khandak.

*Limestone and Marble.*—Limestone occurs in many places. The deposit at Shereikh is the most important one now being worked. Marble is found at Summit.

*Natron.*—Natron (sodium carbonate) is found in the Bir Natrun. The purest is found in a seam from half an inch to two inches thick just below the surface sand, and the best working is about 2,400 yards west of Jebel Kashaf in this Wadi.

*Salt.*—In the arid regions many of the desert gravels are salt-bearing, and in the Butana, east of the Blue Nile between Rufaa and Khartoum, the natives have for many years made a living by the extraction of salt from the surface gravels. Anywhere north of Khartoum, however, salt is extracted wherever these gravels are found, and impure, yellow-coloured salt of local manufacture is sold in nearly every market town.

Many of the natives seem to prefer it to the purer varieties that are imported into the country. The most important localities where salt occurs in beds of considerable size are the Selima Oasis and the lagoons of the Red Sea shore. The Ras Raweiya lagoon, where a very large supply used to be obtained is now being worked by a new concessionaire since 1913. Between June and September, 3,291 tons were forwarded to Port Sudan.

The demand for salt in the Sudan amounts to about 5,000 tons per annum, and after satisfying this demand Raweiya fields are able to export a considerable quantity, mainly to Gambeila, this export now amounting to about 1,000 tons per annum.

In different parts of Kordofan there are deposits of earth from which salt is collected in various ways. At Shershar and El-Gar deep wells are dug and salt extracted by evaporating the water. Darfur is said by the natives and many travellers to be particularly rich in minerals, but the present information is unsatisfactory.

*Mica Deposits.*—Mica deposits exist at Langairio in southern Mongalla.

### *Oil*

Attention is now being paid to the sedimentary deposits on the Red Sea coast, in the hope that in depth they may prove oil-bearing.

### PEARL-SHELL FISHING

Pearl-shell fishing is carried on by the natives off the Red Sea coast. In 1904 the government began to make investigations for the purpose of developing the pearl-shell industry and exploiting it commercially. This industry was brought under a measure of supervision, and in 1911 was held to have made progress justifying expenditure. Pearls are extremely rare, but good specimens are found occasionally. Experimental work on the pearl-shell fishery is still carried on. It had been very much hampered by war conditions.

Three species of *Margaritifera* are found in the Red Sea, two of which are of commercial value, viz. the mother-of-pearl shell, *M. margaritifera* (Arab. *Sadaf*) and *M. vulgaris* (Arab. *Bilbil*). The only fishery of any value is that of the first named. The shell is of fair size, an average weight for a pair of full grown shells being 300–400 grams. The quantity fished annually can hardly be estimated. The records of the Sudan Customs show the following values exported :

	£E.	
1912	2,475,	practically all exported to Great Britain.
1913	15,369,	" " "
1914	2,304,	" " "
1915	3,580,	" " India and Aden.
1916	11,012,	" " India, Egypt, and Eritrea.
1917	4,051,	all exported to Eritrea.

### LIVE-STOCK

The Sudan has large supplies of cattle and sheep, in which a large export trade was developed during the War. The Egyptian market provided a good opening for trade. Over 20,000 cattle were sent thither in 1915, and more than 87,000 sheep and goats. The total number of cattle exported between January and October 1918 amounted to 31,782 head, and of sheep to 151,712 head, as compared with 18,518 and 101,597 during the corresponding period in 1917. In 1918–19 the quarantine stations passed 25,888 cattle and 179,021 sheep for export. Before the War the trade was much retarded by serious recurrence of cattle-plague. Disease still occurs, but the strengthening of the veterinary department keeps it under effective control. Almost every province is capable of a considerable export except Dongola and Halfa, where there is no natural grazing, or such provinces as Mongalla and Bahr el-Ghazal, where the expense of transport at present hinders the development of the trade. The principal diseases are trypanosomiasis, epizootic lymphangitis, and pleuro-pneumonia.

Natives were extremely reluctant at first to sell their cattle

as they had no need of money, their idea of wealth being the number of cattle and sheep they possess. This prejudice is gradually disappearing among the nomad Arabs, but trade with the negroid tribes of the Upper Nile and Bahr el-Ghazal is still almost entirely undeveloped.

The breed of animals stands in need of improvement. The local breed in the White Nile Province and Kassala is very small and few cattle are exported from these provinces. But from the rest of the Sudan some 25,000 cattle of an average live weight of about 750 lb. were easily exported annually, and in 1916 it was estimated that the Sudan was capable of an annual output of 45,000 to 50,000 head. Practically the whole of Egypt's foreign-meat supply now comes from the Sudan, and the Egyptian market will fully tax the Sudan's resources during the immediate future. The development of the trade depends on the efficient control of disease and occasional setbacks owing to drought must be anticipated.

Camels are the principal means of transport in the desert and intermediate zones. The range of the horse is much the same as that of the camel, but extends a little farther south. Mules and donkeys are the most widely distributed transport animals. Oxen are used for transport in the dry season between Wau, Tonj and Meshra and Shambe and Rumbek, but cannot go farther south than Mvolo.

#### *Cattle*

Cattle are generally distributed over the whole country. The largest herds are kept by the black races in the south. North of Khartoum and Kassala they are least numerous, owing to the poverty of the pasture; but considerable numbers are kept in the intermediate zone, especially in the Kassala and Gedaref districts, and graze the Butana plain. Cattle become plentiful south of lat. 13° N. Large herds are owned by the Baqqara of south Kordofan, and the Nuba tribes of Nuba mountains. The camel-breeding Arabs of the north are rapidly increasing their herds. Cattle are the

principal, if not the sole, wealth of the black tribes of Sennar, Upper Nile, and north Bahr el-Ghazal Provinces, especially of the Shilluk, Dinka, and Nuer.

The common breed is small, with a hump. The bulls, much used as pack animals, are very docile. In Darfur two breeds are kept, the humped zebra, which is strongly built and fattens well, and the African long-horned race, which is seldom of much value. The Shilluk breed is large and of good stamp, but liable to a special type of trypanosomiasis. Owing to the poverty of the pasture the yield of milk is not great. The Shilluk are excellent herdsman. The Dinka breed is humped and nearly white. The herds are larger than those of the Shilluk. Both these tribes keep cattle for milk and butter, not for meat. They regard cows with almost superstitious reverence, and only kill them for sacrificial purposes, though animals dying of disease are eaten. The herds are kept in villages or cattle zarebas (*marah*) during the rains, but go long distances to pasture in the winter months. Those owned by the Nuer of the Sobat and Baro are exceedingly fine.

In the south-west Sudan the prevalence of tsetse and other flies makes cattle-breeding impossible. The southern limit of the cattle-owning tribes, running through Chak-Chak, Wau, and Rumbek, coincides with the northern limit of the iron-stone country. South and west of this line they are found only in the villages of the Jur and Atwot tribes; and, if imported, quickly sicken and die. In all the swampy districts the cattle are chronically out of condition.

### *Sheep*

Sheep are generally distributed, and are more plentiful than cattle in the dry zone. Large flocks are kept by the nomads of the Atbai and Bayuda. In Kordofan sheep are numerous. Those grazing the northern steppes often go three or four days without water. In the south a small and very active breed is kept, carrying more meat for its size than the ordinary Arab sheep. In Darfur where large flocks are common, especially in the south, the Zaghawa have



a breed with long curly fleece ; but with this exception the sheep bear little wool. The meat is usually good. Considerable flocks are kept by the Shilluk, Dinka, and Nuer. These are of a special breed, with long, shaggy manes covering the shoulders and chest, the rest of the hair being short. They are mostly stunted and in poor condition. The southwestern limit of sheep is the same as that of the cattle. The sheep exported weigh about 120 lb.

### *Goats*

Goats are generally kept, and it has been estimated that the stock runs to several millions. They are numerous in the Atbai and Bayuda districts, and in Kordofan and Darfur. Those kept by the black tribes farther south are poor and stunted. They do not extend into the ironstone region.

### *Ostriches*

These are kept in captivity in small numbers by natives of the poorer class in Kordofan ; but the ostrich farming industry is not thriving. Wild ostriches are found both in the western and in the southern Sudan.

### *Fowls*

Poultry is found everywhere, except in the extreme southwest of Bahr el-Ghazal and Mongalla Provinces ; but the quality of both birds and eggs is generally poor.

### *Camels*

Camels cannot live south of Kordofan and Kassala Provinces. The best Sudan camels are lighter and swifter than those of Egypt. An excellent strain is owned by the Bisharin of the Atbai, especially the Malak division of the Aliab, and also by the nomadic Arabs of the Bayuda desert. The Bayuda is the favourite district for the breeding and rearing of *hagins* (light, fast, riding camels). In Kordofan the principal camel owners are the Kababish and Kawahla, who own herds numbering many thousands. These are mostly

strong, heavy animals, good for slow transport, and much used in the gum trade, but not suitable for riding. When working they are watered every fourth day, but when grazing can go ten to twenty days without water, and in winter, if the fodder is green, thirty or forty days, or even more. During the rains camels cannot be used south of lat.  $12^{\circ} 30' N$ . The Zeiadia, Maharia, and Bediat tribes of Darfur are breeders on a considerable scale. East of the Nile and north of lat.  $13^{\circ} N$ . the camel is the principal beast of burden. Good animals for transport and riding can be had in the Kassala district and a limited number at Gedaref.

### *Horses*

The Abyssinian and Dongola breeds are the best in the country (the latter is noted for its strength and hardiness) ; but all have deteriorated from careless breeding. In Kordofan many horses are owned by the Baqqara tribes. The common type is a fairly compact build of pony with good bone. These ponies stand a lot of work and only drink once a day. Those bred by the Messeria are the best, many showing signs of Arab blood and of descent from good sires. They resemble the type known as Gharbawi, which comes from El-Fasher, and are greatly superior to the Hawazma stock. Mares are valued, and generally kept in better condition than horses. In Darfur the Mohamid tribe breed a small sturdy type of horse called *tama*, which can on occasion travel sixty hours without water. On the eastern frontier horses are less numerous. A few are imported from Eritrea and Abyssinia to the Kassala district, but suffer much from the serut. Horses cannot live in the tropical zone ; if introduced, they quickly succumb to tsetse or some other plague. A beginning was made in 1913 with the government encouragement of horse-breeding.

### *Mules and Donkeys*

The best mules for use in the southern zone are of the Abyssinian breed. These are comparatively resistant to

tsetse, to which the Syrian mule soon succumbs. The little Abyssinian donkey, which best suits the hill country, is numerous in the Kassala and Gedaref districts, and much used for traffic between Abyssinia and the Sudan. In Kordofan donkeys are very common. The breed is small and hardy, capable of travelling fifty or sixty miles in a single march, and of going for a day without water. In southern Kordofan the boggy soil and the prevalent serut makes the employment of donkeys during the rains costly if not impossible. The Dinka and other black tribes, which formerly knew nothing of animal transport, are now gradually taking to the use of donkeys. In the fly-belts these suffer severely from tsetse, and, though they may work from two to four months after their introduction, they almost invariably die. The government is trying to improve the breed of mules.

### *Dogs*

The Egyptian 'Pariah' dog is common in most of the villages. Domesticated dogs for hunting are kept by the Arabs, Nuba, and many of the black tribes. Considerable use is made of dogs in the great game-drives of the Nuer, east of the Nile.









## CHAPTER X

### TRADE, LABOUR, AND INDUSTRIES

General economic survey—Trade—Statistics—Labour and industries.

#### GENERAL ECONOMIC SURVEY

FULLY to understand the economic position of the Sudan, the peculiar nature alike of the country and of its history must be kept in mind. Although of vast extent and great variety, a large part of the area of the Sudan is made up of sterile deserts (which may perhaps contain veins of valuable minerals), and of flooded or marshy surfaces which are incapable of yielding any return; what remains is probably rich enough in natural products, and fertile enough, where cultivation and pasturage are possible, to recoup the efforts of a very much larger population than the present, besides furnishing a relatively considerable export trade: Under the present government the country has been steadily progressing economically and will continue to do so, but the highest possible development of which it is capable can only be attained very slowly by the increasing application of scientific methods to irrigation, cultivation, stock-raising, industry, external commerce, &c., and with the aid of a much larger population, and one more developed morally and intellectually than it now possesses. What has already been accomplished has been very remarkable, and highly creditable to the administration, and in time it will be possible to put into execution the plans contemplated whereby the country may be raised and organized to its fullest economic capacity.

How vast and intricate a task the actual and prospective development of the Sudan has been and remains it would be difficult to over-estimate. It necessitates taking into the fullest and clearest account the factors of climate, composition



and formation of the surface, hydrographical conditions, density, nature and level of culture of the inhabitants, the diseases to which men, animals, and plants are subject. The Wellcome Research Laboratory has proved very helpful in investigating many questions of soil, fertility, tropical diseases, and other such topics of direct practical importance.

The administration had first of all, however, to deal with the most primary and pressing questions, and cannot yet be held to have finally disposed of these. It had to establish peace and maintain it firmly, to administer justice, to initiate and inculcate laws, to organize a good fiscal system, and to facilitate the creation of wealth by improving the means of transport, communication, and exportation. This indispensable preliminary task it is performing with remarkable success and rapidity, and without burdening the population with imposts or *corvées*. The task was in itself enormous.

In 1899 the Sudan was as a whole desolate. Lands once fertile and productive had gone out of cultivation, villages were deserted, the population was about a third of what it had been, and actual famine was seriously threatened. The subsequent recovery of the country from the long period of war and disorder has been very remarkable. Whereas in 1899 only some 682,000 feddans were under cultivation, there were in 1913 no fewer than 2,300,000. Still, however, it is only about one-half per cent. of the Sudan which is cultivated, and that for the most part in a rudimentary fashion. The sparse and largely semi-nomadic population, in which the urban element occupies a relatively very large place, offers, in consequence of invasions and immigrations, a bewildering collocation of heterogeneous races, languages, customs, and faiths ; but in spite of this, and of the tendency still present towards collective agitations caused by religious or ethnic sentiments among a people that is almost everywhere combative, impulsive, excitable, profoundly ignorant, and of boundless credulity, the country as a whole now enjoys the tranquillity which is favourable to economic development. A large proportion of the population, however, is almost

without wants, and human activities are in many regions of the Sudan at a level below which man can scarcely descend. A great number of the inhabitants live almost or entirely without clothing; dura, and in some places fruits and milk, form almost their whole diet. Also, since slavery has ceased to be sanctioned, they only furnish a minimum of labour, and that on conditions that are very onerous for their employers.

Previous to the present administration, commerce in the staples and necessities of life had been practically non-existent in the Sudan. Articles of luxury, ivory, feathers, gum, choice woods, gold, and slaves had formed its commerce for centuries, and in defence of exploiting the country solely for such commodities, it could be urged that they alone could defray the cost of transportation.

Altogether a very difficult economic situation faced the administration out of which to create a self-sustaining state, paying its own way, financing its own development, and steadily increasing in material prosperity. Perhaps the most immediately pressing necessity was the provision of means of communication. The creation and maintenance of these will always remain costly, and railways in particular subserve the economic improvement of the country rather than their own interests. To improve the navigability of rivers was a matter of the first importance, but the extension of the railway from the Nile to the Red Sea was the great event in the Sudanese system of communications. The opening of Port Sudan and the railway to it almost suppressed the transit trade from the Sudan across Egypt, the new route offering to European goods a much cheaper route. The new connexion also quickly benefited the growers of the interior by giving them ready access to the market for their grain in the Red Sea districts and by cheapening the cost of transport of their produce generally. The saving in time was also important. Goods from England saved several days in going to Khartoum via Port Sudan as compared with the Nile route, and could be forwarded in 18-20 days. Khartoum

could now be reached from the coast in 19 hours instead of 4 days by the Nile route. The existing communications are fully discussed later (see p. 523).

Halfa, Berber, Dongola, Suakin, Khartoum, and the northern part of the Gezira are on a higher economic level than the other provinces. Almost the whole cultivated area there is now measured, registered, and supplied with fair means of irrigation, either natural or artificial, and production is developing satisfactorily. Sennar and Kassala Provinces are developing slowly into ordered economic conditions, and Kordofan and White Nile have already made considerable progress in that direction. Mongalla, Upper Nile, Nuba Mountains, and Bahr el-Ghazal show their low stage of economic development by their inability to contribute to the necessities of the land as a whole. Darfur, which has only recently been occupied, is settling down satisfactorily.

In the development of a land full of great possibilities, expenditure may appear disproportionate to income and yet be a well-justified investment, and that is how Sudanese finance must be regarded. The rapid success of the work accomplished in the Sudan since the conquest is due to the qualities of the English administrators, well seconded by the Egyptian officials, and to the military and financial resources furnished by Egypt, Great Britain's partner in the society formed for the development of the Sudan. It has been possible with such assistance to accomplish a great deal in a comparatively short time. Numerous buildings have been constructed, roads and railways made, the navigability of rivers improved, a maritime port provided and equipped, large irrigation works begun, and works of hygiene and public instruction proceeded with.

The Sudan has responded admirably up to the present to capital expenditure and there is a wide field for the further development of its natural resources principally by means of the extension of transport facilities, exploitation of the live-stock trade, and of cotton cultivation. The Sudan, however, is not a 'white man's country' and there is little

scope for the small European farmer or stock raiser. On the other hand, for development schemes on a larger scale there are or will be considerable openings, such as well-sinking, supply of water for native cultivation, motor transport, farming of large estates, meat-canning, tanning and the financing of native enterprises, such as the purchase and export of cattle and sheep, gum, and oil seeds.

The foreign commerce of the Sudan has been governed by the treaties in force in Egypt, the only treaty peculiar to the Sudan being the Customs Convention with Eritrea, 1902, which fixes the import duty on natural produce imported into either of these countries from the other at 5 per cent. and the export duty at 1 per cent., prohibits traffic in arms and ammunition and makes the traffic in liquors dependent on permission. By agreement with the governments of Uganda, Belgian Congo and French Congo, the Convention applies also to these countries.

The branches of the National Bank of Egypt established at Khartoum and elsewhere and of the Anglo-Egyptian Bank at Khartoum offer excellent facilities for financing the import and export trade of the country. The usual advances are made against merchandise and the banks dispose of produce on behalf of their customers.

The National Bank of Egypt which is guaranteed by the Egyptian Government does the banking business of the Sudan Government. A Post Office Savings Bank has been established, but there are no co-operative credit societies.

In all matters of economic development a primary consideration always kept in view by the government is to protect the native against unfair and unscrupulous exploitation and maintain him in possession of his land and the means of cultivation.

The government has for long issued small loans to cultivators, and great care is taken to secure that these loans are profitably expended e.g. on purchase of working cattle or implements. The provision of markets under government supervision, as for instance at Tokar, El-Obeid, Gedaref, &c., where produce

can be sold on the spot for cash and seed loans repayable after the harvest also tend to protect the native against usury. After the outbreak of war great assistance was given the native cultivator at Tokar and elsewhere by the direct purchase by Government of his crops or by purchase under government supervision.

The merchant class comprises many nationalities. The Greek petty trader is to be found all over the Sudan. He is the principal shopkeeper of the country, and also the chief link between the large buyer of produce at Khartoum and other centres and the native producer in the out districts. Syrians, Egyptians, and Armenians are also numerous and are occupied in the same type of business as the Greek. The Indian trader's activities are mostly confined to the Suakin neighbourhood which has been in close touch with India via the Arabian coast for centuries. The nondescript 'Levantine' has also drifted into the Sudan from Egypt and does a good deal of agency business.

The Sudan native trader, however, is taking an increasing share in the trade of the country. The Arab is a great traveller and trader and the itinerant 'Gellaba' (pedlars) go far afield. Many of these are of Danagla origin.

Recent developments in the export of grain, cattle, sheep, hides and skins, and Tokar cotton, have led to a considerable increase in the importance of the native merchant, some of whom are now in a large way of business. The majority of them have little share as exporters in the trade of the country, except as regards export to Egypt, Eritrea, and Arabia.

British trade is mostly represented by a few firms established at Khartoum, Port Sudan, and one or two other centres. Some of these firms have a large turnover, especially in the export trade. British interests are also very strong in the shipping business. Before the war two-thirds of the shipping was in British hands and during the war practically all ships calling at Port Sudan were British. A Sudan chamber of commerce was organized in 1908; it comprises most of the leading merchants among its members.

German and Austrian subjects were doing an increasing trade before the outbreak of war, but they were then removed. There are very few French or American merchants in the country. In the eastern Sudan Italian traders have recently shown some activity and have lately extended their operations to the Kordofan gum trade.

Barter is still carried on in one form or another in many parts of the Sudan, but the circulation of money is increasing rapidly especially of silver, much of which no doubt is hoarded and made up into silver ornaments. National Bank of Egypt notes were readily accepted by natives in the larger towns, but gold was not popular. European trade goods are now making their way all over the country to the benefit of trade, but the wants of the bulk of the population are still very primitive. In this connexion it has been suggested that floating exhibitions of foreign goods suited to native tastes might have a beneficial effect in creating new demands.

Commercial legislation has made considerable progress, especially of late years. 'Bills of Exchange' and 'Bankruptcy' ordinances have recently been promulgated and a new Customs ordinance has been issued. Legislation for the prevention of the adulteration of exported produce and for the simplification of weights and measures has not yet been introduced, but various reforms have been carried out by administrative orders, e. g. the 'kantar' of gum has now been standardized throughout the Sudan at 100 rotls. The provision of cleaning machines by government has done much to improve the cleanliness of the grain exported.

Although the country had time to adapt itself to some extent to new conditions, and to take such measures as were possible to meet trade difficulties, the war inevitably produced many commercial problems, and the outlook was far from promising in the early stage of hostilities.

Fortunately, after a time of considerable difficulty, particularly as regards shipping space for exports to Europe, the situation greatly improved; Egypt, cut off for the most part from overseas supplies for its civil population, drew largely

upon the Sudan for food supplies both for itself and for the British Forces, and there was a large demand for Sudan grain in Eritrea and along the Arabian coast, owing either to failure of the harvests or to shortage of supplies from other sources. The entry of Italy into the war led to a large demand for hides and skins from the Sudan. Cotton was sold for unprecedented prices. Gum exports were kept up to a fair level. Imports also came in satisfactorily in spite of the scarcity of tonnage.

The coincidence of good rains and strong external demands for raw products led to a period of prosperity such as had never been known before in the Sudan. Exports to Egypt increased in value from £E404,709 in 1914 to £E1,045,250 in 1916 and to £E2,589,541 in 1917 and direct exports to Great Britain from £E269,543 to £E649,827 and £E707,636 in the same years.

### TRADE

As regards external commerce the object principally in view has been the extension of exportation, and, as a corollary, the substitution of Sudan products for imported goods.

The great difference existing at first between the total values entering and leaving was normal, because the advances made by the Egyptian Government and other capital expenditure abroad necessarily took the form of imports of goods and specie. It was felt desirable, however, that the goods thus serving to regulate the balance of accounts should oftener be of a productive nature. Much of what the government imported was such, as coal, cement, wrought iron and steel, and machinery, but the merchandise imported by the public contained a good proportion of articles which ought to be produced in the Sudan. It has to be added, however, that the importation of some of these commodities was compensated for to a certain extent by their re-exportation.

In 1906 the Central Economic Board was constituted and the Customs Department reorganized, and for the first time exact trade statistics were obtainable. The export trade,

small as it was, had wide ramifications, and the trade in some of the more important products, such as gum, ivory, ostrich feathers, already possessed a certain momentum. The rest of the major economic products consisted of cotton, wheat, rubber, cattle, hides, skins, and mother-of-pearl shell. Progress with cotton and wheat was seriously handicapped owing to restricted water supply and lack of labour; the outbreak of plague had practically put a stop to the export of cattle, and to a large extent of hides and skins; rubber was in the experimental stage.

The import trade of the country was expanding, and the export trade was beginning to take a favourable turn as compared with 1905, the principal increases being gum, ivory, ostrich feathers, and rubber.

The total net increase of trade for 1907 was £E566,843. Exports of bona-fide Sudan produce showed an increase mainly due to cotton and gum, and the transit traffic had grown from £E13,153 in 1906 to £E32,523 in 1907. Now that the interior was connected with the Red Sea coast by rail, the conditions of trade were rapidly changing, and consequently the trading public. Hitherto one had had to deal with the small trader, ready to take advantage of conditions adverse to the general public, lacking in initiative, and expecting too much from government assistance and protection. A new class of merchants was springing up, and good European firms were endeavouring to expand their trade.

The year 1908 was a period of financial depression in Egypt and consequently in the Sudan; but, in spite of this, commercial prospects were, if slowly, improving. The export trade, which in 1908 amounted to £E515,938, was an increase of £E66,609 over 1907, or 14.82 per cent. Notable increases were, sheep and goats (£E12,664), clarified butter (£E5,106), dura (£E33,799), mainly due to the growth of the trade with Egypt, sesame (£E5,348), due to good prices in Egypt, gum (£E20,679) due to a good crop and the continuance of high prices in Europe. Cotton (decrease £E15,347) had been



unfavourably affected by the fall of prices in Egypt. As compared with 1907 the export trade of Port Sudan had increased 27·7 per cent., of Halfa 34·8 per cent., while that of Suakin had decreased 17·6 per cent.

The value of merchandise imported by the public in 1908 exceeded that of 1907 by 18 per cent., an indication of the increasing prosperity of the native.

The proportion between public imports and exports was, imports 68 per cent. and exports 32 per cent., as compared with 78 and 22 per cent. in 1906, and 67 and 33 per cent. in 1907. If government imports be included, the proportion in 1908 between imports and exports was 78 and 22 per cent. respectively. The total value of specie imports in 1908 was £E60,172 as against £E102,361 in 1907.

Trade was thus in general making good headway in 1908 under circumstances which, if improving, were not yet too favourable. With easier money the trade results in 1908 would have been still better, and it was not so much the increase of exports as the remarkable responsiveness of the country to improvement in conditions of production that afforded cause for satisfaction.

By 1909 the experience of the previous three years went to show that the Sudan had a sound commercial future as an exporter of raw materials and foodstuffs. The collapse of the land boom had forced the attention of merchants to less speculative forms of commerce. Exports had increased by 30·6 per cent., and in addition to such staple products as gum, ivory, and ostrich feathers, other articles began to figure notably on the export list. Gum, which has throughout (except in 1915) retained its position at the head of the Sudan exports, amounted to 13,282 tons, an increase of 3,174 tons over 1908; but the export of dura was the most striking development in the trade of the year, amounting to 22,352 tons, an increase of 11,888 tons over 1908; largely due to an exceptional demand in Egypt. The value of the export of sesame was £E63,066, an increase of £E37,982 over 1908. The export of sesame, like that of dura, was

a comparatively new one, but it had the advantage over dura that it was already possible to put it on European markets with profit, while Egypt alone had an annual demand for £E100,000 worth. The value of the export of sheep and goats was £E39,395, an increase of £E7,283 over 1908, and it was evident that a most remunerative trade in cattle might be fostered with Egypt, if certain quarantine measures proved a success.

Altogether during 1909 as compared with 1908 the value of imports had decreased by £E116,841, while the value of exports had increased by £E157,964 or 6.1 and 30.6 per cent. respectively. Re-exports had increased by £E23,862 or 64.3 per cent. and transit had decreased by £E2,286 or 6.9 per cent. There was an increase of £E129,589 on imports and exports via Port Sudan, a decrease of £E48,775 on those by Suakin, and an increase of £E81,321 on those by Halfa. The proportion of exports to imports was 37.9 per cent. as compared with 27.2 per cent. in 1908. The import of specie amounted to £E44,158, a decrease of £E16,014 as against 1908.

It was not easy to ascribe the decrease in the value of imports to any particular cause. It was partly due to the continued effect of the financial crisis of 1907, and to large decreases of government purchases. It did not appear that the natives had been much affected by the conditions governing the import trade in 1909, and that the decrease was rather to be explained by the credit difficulties of many European merchants in Khartoum and other centres.

The total volume of trade in 1910 was £E3,013,433, whereas in 1908 it had been £E2,478,723, and in 1909 £E2,541,422, an increase within the last year of 20 per cent., largely due to the rapid growth in the quantity and value of exports, the value having increased no less than 270 per cent. in four years. The recovery of the import trade, the marked continuous growth of exports, and the increase in specie imports and in the transit trade were the most noticeable features in the year's statistics. The proportion of exports to imports was increasing and the balance of trade gradually

adjusting itself ; thus, while that proportion was 27·2 per cent. in 1908 and 37·9 per cent. in 1909, it was 50·6 per cent. in 1910. This improvement in the ratio between imports and exports was mainly due to the increase in produce exported, but was also partly accounted for by a slight diminution in the rate of progress of the import trade. The value of imports in 1910 was 8·7 per cent. greater than in 1909, but only 2 per cent. above 1908. The value of food and apparel imported had increased considerably in 1910, but although wood and coal had increased, metallic goods, including machinery, had decreased, owing to the gradual completion of the initial programme of capital expenditure by Government. The quantities of cotton fabrics, sugar, coffee, perfumery, tea, and spices imported had risen from £E616,226 in 1908 to £E678,701 in 1910. The share in the external trade of the country of Port Sudan was £E1,589,494, of Suakin £E515,067, and of Halfa £E807,963. Whereas, in 1909, 49 per cent. of the import and export trade was carried on with Egypt, 52 per cent. of it was carried on in 1910.

The export of gum in 1910 was 13,577 tons. In October the price reached P.T. 296 per 100 kilos. Practically the whole of last year's crop had been readily disposed of in Europe. Of dura 32,377 tons were exported, of which Egypt only took 19,000 tons, showing that the Sudan was exporting dura to Europe and the East in some quantity ; 4,230 tons were shipped to Europe alone, and 4,000 tons to Aden. Whereas in 1909 cotton (lint and seed) exported was of the value of £E65,283, it had risen to £E235,176 in 1910. Of sesáme 5,905 tons were exported. The value of the trade in live-stock had increased from £E40,788 in 1909 to £E110,438 in 1910. A new item of export was the fruit of the dom palm.

Thus by 1910 the trade of the country appeared at last to have been stirred from its comparative stagnation, and to have gathered a certain amount of impetus, causing it to make genuine progress towards prosperity. The native was

beginning to feel the effect of closer contact with Europe, and it seemed possible that the potential wealth of the Sudan could be made attractive to foreign capital sooner than was at one time anticipated. Only the small beginnings of the process of development were as yet apparent, and the Government still possessed little more apparatus than that which had been designed to deal with an earlier state of affairs. Large schemes of exploitation were beyond its capacity and outside its immediate duties. The wonderful recuperative power of Egypt had led people to expect too rapid progress in the Sudan. A tendency aggravated by speculation due to the boom in Egypt had led to impatient members of the public occasionally meeting with disappointment; but the aspect of economic problems was certainly changing, and necessitating the consideration of a policy that would satisfy both the native and the foreigner.

The actual statistics for the year justified the growth of a greater confidence in the progress of the country. An experiment in the export of cattle and sheep to Egypt had resulted in the export during the year of some 5,000 cattle and 60,000 sheep, which made practically no impression on the Sudan supply. As regards cereals, a calculation over a period of years showed that Egypt's annual average purchase from abroad of wheat, barley, and maize amounted to 14,000 tons, 11,000 tons, and 14,000 tons respectively, and that, given reasonable irrigation facilities, the northern Sudan could supply much more grain than this. Oil seeds, which grow with profusion in the Sudan, were being increasingly exported, including *senat*, a wild product regarded hitherto as a weed. The cotton industry was yet in its infancy, but cotton was at last being exported directly to Liverpool, where better prices could be got than in Egypt.

It was felt that further economic expansion, if it was to be continuous, would require the strengthening of the commercial ties with external markets, and larger resources and wider economic views would be necessary.

By December 31, 1910, the railway to El-Obeid was

completed, bringing the gum of Kordofan within easy reach of Port Sudan. For the year 1911 the register tonnage of shipping recorded at that port was no less than 701,110 tons as against 312,770 tons in 1907. The continuous and rapid growth of shipping and of the value of exports, which had risen from £E449,329 in 1907 to £E1,376,958 in 1911, showed that the Sudan had something of interest to offer the outside world, and that the Nile Red Sea Railway was bringing the country into contact with the main stream of commerce.

Statistics of the value of the total external trade of the country brought out the important developments of the years 1909-11 clearly. It had risen from £E2,541,422 in 1909 to £E3,779,526 in 1911. The new situation was, that, owing to the development of internal and external means of transport, the Sudan produce could now under ordinary circumstances be sold with profit on European and foreign markets, portions of the country were capable of more rapid exploitation than was originally expected, produce was forthcoming in larger quantities than was thought possible, and the native was showing himself ready to grow not merely the ordinary rain crops of grain and oil seeds, but also the far more valuable product cotton; but it would not do to trust to the undirected operations of the native or the middleman.

The value of government supervision was exemplified in the great improvement it effected in the Tokar cotton crop, which happened to be grown on government land. The value of this had appreciated noticeably, while the wealth of those concerned with the production had increased some 30 or 40 per cent. Tokar cotton, formerly of very inferior quality, was now selling at about the same price as cotton grown in Upper Egypt, and in some cases for more, and European and Egyptian interest had been attracted to the crop. Since the Tokar crop had been taken in hand rain-grown cotton from the Gezira and elsewhere had come to represent some 30 or 40 per cent. of the total export of cotton, but was of inferior quality. Consequently the reputation of Sudan cotton

required that the improvement effected at Tokar should also be effected south of Khartoum, where, however, it would probably present more difficulties.

The cattle trade had been created almost entirely by government effort. In 1907 the export of live-stock, hides, and skins was only £E31,702 in value, whereas in 1911 these exports were valued at £E254,958, an improvement entirely due to government control of cattle disease and movements of cattle. Another matter in which the government was effecting improvement was the grain crop, by offering facilities for cleaning the grain. Throughout the year 1911 much attention had been paid to devising methods for conserving the capital of the country and preventing wasteful methods of exploitation.

The gum trade, the most valuable in the Sudan, also afforded a field for the employment of government resources. In the year 1899 to 1906 inclusive the average annual export of gum was 7,064 tons; for the years 1907 to 1910 inclusive it was 11,573 tons; in 1911 it was 14,357 tons. In spite of this great increase the state of affairs was not altogether satisfactory. There were indications that in this industry the country was living on its capital, as some of the gum forests were being gradually worked out. The opening of the line to El-Obeid by making the gum districts more accessible had made the need for action in this matter more urgent. Another of the country's assets which was being gradually worked out was its timber supply on the river banks.

The government was gradually building up a technical staff to supply the scientific advice necessary for the application of modern principles in the cultivation of the resources of the country.

Wheat appeared notably in 1911 in the list of Sudan exports, some £E7,619 worth having been exported. In all the country had increased the value of its export trade from £E449,329 to £E1,376,958 in five years. The value of exports in 1911 was 40 per cent. higher than in 1910, while during the last five years it had increased by 384 per cent.

The value of the import trade had also increased rapidly. But the figures of the value of imports and exports produce an impression of somewhat more rapid progress than had actually been made. For instance, the great rise in the price of gum had helped to swell the value of exports. On the other hand the price of cotton had fallen considerably.

In 1911 there had been exported, in round figures, 3,600 tons more cotton (lint and seed) than in 1910, 16,000 more cattle, 34,000 more sheep, 80 tons more hides, 140,000 more skins, 200 tons more ground-nuts, 670 tons more dates, 2,370 tons more dom nuts, and 780 tons more gum.

The increase in the value of imports in 1911 was very largely due to the greater importation of cotton fabrics. This showed an increase in value in 1911 of £E159,752 over 1910, while the quantity imported had increased from 3,121 tons to 4,370 tons. This was an indication of native prosperity, especially as credit was not now given as freely as formerly.

The value of exports in 1911 was 60·5 per cent. of the imports. Imports by the public were nearly double the value of government imports. The value of imports from Egypt was £E902,513, an increase of £E27,750 over 1910. The value of exports to Egypt was £E757,330, an increase of £E116,579 over 1910. The value of direct imports from Great Britain was £E793,416, an increase of £E193,046 over 1910. The value of direct exports to Great Britain was £E226,230, an increase of £E125,957 over 1910. It has to be remembered, however, that a large proportion of the goods exported to Egypt are dispatched thither for re-export to Europe and elsewhere, and that similarly many goods from Great Britain and other foreign countries are imported into the Sudan via Egypt, and appear in statistics as imports from Egypt. A point of interest was the large increase in the value of specie imported, £357,705 (including £E70,416 re-exported via Halfa), an increase of £E231,577 over 1910.

Efforts had been made to extend trade with Abyssinia via Gambeila, and, after considerable disappointments, prospects appeared to be improving. The trade had increased from

£E25,902 in 1909 to £E43,874 in 1910 and to £E65,716 in 1911.

The total value of trade in 1912 was £E3,479,652, a decrease as compared with 1911 of £E299,874. This result was due to a falling off in the import trade, the value of exports being practically the same as in 1911, i.e. £E1,373,119 and £1,376,958 respectively, whereas the value of imports was only £E1,967,429, as against £E2,273,949 in 1911. The check in the remarkable advance of the export trade was almost entirely due to insufficient rainfall. The export of gum was the largest on record; the quantity was 19,615 tons, valued at £E603,511. There was actual over-production, which involved certain merchants in somewhat of a crisis, since towards the end of the year those who had not got rid of their holdings had in some cases to submit to a loss of P.T. 50 or P.T. 60 per kantar.

Expressed in bales of 400 lb. the cotton lint exported in 1912 amounted to 15,000 bales, a decrease of 7,823 bales on 1911. The total value of cotton and seed exported amounted to 8,158 tons of a value of £E155,004, a decrease of 4,172 tons and £E112,425 respectively on 1911. The causes of this decrease were a deficiency in the Tokar cotton crop and very much smaller production of rain-grown cotton owing to the drought. Egypt took up 872 tons (value £E48,251) of ginned cotton, and 2,850 tons (value £E48,887) of unginned cotton, and 1,794 tons of cotton seed (value £7,741), Great Britain took up 735 tons (value £E39,637) of ginned cotton, Abyssinia 120 tons (value £E1,004).

The newly-developed trade in the export of live-stock, hides, and skins was continuing to expand, the value of this export being £262,006. This was an increase of £E7,048 on 1911, in spite of lack of grazing as well as outbreaks of disease. The export of cattle and sheep to Egypt was almost entirely in the hands of natives, but hides and skins were also exported by Europeans. There was a small but satisfactory increase in 1912 in the latter export. The value of oil seeds exported was £E115,149, a decrease of £E1,360 on 1911, the crop having



suffered from the unfavourable weather, but the export of sesamæ had increased owing to exceptionally good rains in Kordofan. There had been a further increase in the quantity and value of ivory exported of 8 tons and £E20,533 over 1911, the totals being 107 tons worth £E94,465 in 1912. The bulk of the ivory exported goes to the London market, but a point of interest in 1912 was that some £E21,000 of ivory was consigned direct to the United States.

As regards the imports, the principal causes of the decrease were the reduction in the quantity and value of the imports on government account owing to the completion of the El-Obeid railway, and a smaller importation of cotton piece-goods by the natives, whose purchasing power had been affected by the high price of grain. The value of the imports by the public and the government in 1912 fell short of that of 1911 by £E306,520, or 13·4 per cent.

The value of imports from Egypt was £E944,466 in 1912, an increase of £E41,953, or 4·6 per cent. The value of exports to Egypt (£E627,453) had decreased £E129,877, or 17·1 per cent. from 1911. The direct imports from Great Britain amounted to £E520,756 in 1912, a decrease of £E272,660, or 34·3 per cent. from 1911. The direct exports to Great Britain had increased to £E268,255, an increase of £E42,025, or 28·5 per cent., on 1911. The direct exports to the United States had increased to £E118,716 in 1912, an increase of £E70,091, mainly due to direct consignment of ivory and gum. The imports from India amounted to £E203,347 in 1912, an increase of £E48,298, mainly due to the importation of grain.

In some respects, then, 1912 was an unsatisfactory year. For the first time for a considerable period there was a decrease in the value of the external trade. The satisfactory level which the value of the trade had maintained under exceptional difficulties proved the efficacy of the measures devised during the preceding years to strengthen the means of production, since these averted what might have been a crisis in trade, or at least the experiencing of hardship by the population.

The guarantee this year by the British Government of

a loan of £3,000,000 for the development of cotton-growing, mainly in the Gezira (see p. 370) marked a phase in the effort to develop the resources of the Sudan. This, with the results achieved in the initiation of cotton cultivation at Tayiba and the completion of the El-Obeid railway, made 1912 a memorable year in the economic history of the Sudan. Unfortunately this year had a less desirable claim to distinction as being that of the highest recorded price for dura since the re-occupation, a matter which was to become worse. Whereas in 1910 32,377 tons of dura had been exported, only 17,794 had been exported in 1911, and only 796 in 1912. The scarcity of grain of all sorts had resulted from the partial failure of the rains in these three years. Roughly speaking, the price of dura was, in 1912, about three or four times as great as in 1910. There was privation in some localities, but the population did not, as a whole, suffer much from the scarcity of crops. The urban population had an ample margin to meet the rise in the price of food, and natives in the grain-producing districts fell back on their accumulated stores of dura, as they are in the habit of burying their surplus grain in pits, for use in case of need; others had fresh sources of income arising from the opportunities for trade and cultivation provided by the government.

While the fate of the dura crop is an index to the economic position of the native and the course of trade, the current price of dura is not always a safe guide to the actual state of affairs. Natives are of opinion that a full *matmura* (pit in which dura is buried) is the safest bank. It is found that when grain is dear labour is cheap. A man with 50 ardebs of grain to spare will not sell before the next harvest, when grain is dear, but, as soon as the next year's crop is assured, will dispose of his store at a price perhaps one half of what he could have obtained two months before. He will borrow cash on his anticipated crop, rather than dispose of a present surplus. In the Gezira grain may be buried seven years and more, elsewhere five, four, or three years is the limit. Spoiled grain has eventually to be sold, and an appreciable amount is

entirely lost. On the whole there is no close connexion between market prices and the state of the last harvest, and probably high prices did not cause a rise in the necessaries of life except for the urban population. The opinion was even advanced that in some places the abnormal rise in the price of dura was partly due to the cheapening of money.

Other factors which helped to counteract the difficulties of the situation was the large increase in the output of gum (which was exported to the value of £E603,511), the continued excellence of the Tokar cotton crop, the institution of basin cultivation by the government in Dongola Province which enabled the population to produce considerable quantities of wheat and barley, and the development of the export trade in live-stock.

The promulgation of the Cotton Ordinance this year (see p. 381) was of the utmost importance, meaning that practically all movements of cotton seed would be controlled and the cotton-growing industry gradually brought under supervision. Owing to the virtual disappearance of the export of dura it was not practicable to bring into immediate operation measures to secure its proper cleaning and possibly grading before export, but it was felt to be desirable to take steps regarding the adulteration of sesame, now being produced in large quantities, and some were taken successfully. It was recommended that an Ordinance should be prepared to deal not only with the cleaning of sesame, but other Sudan produce also. A plan for the protection and maintenance of the gum forests was being elaborated.

Closely allied to the question of safeguarding the country's capital assets was that of the substitution of home production for importation. Owing to various difficulties, little progress had been made in the growing of wheat, maize, and other cereals as a set off against the large and increasing importation of wheat flour, but it was believed that the substantial export of salt could be revived and the timber and subsidiary forest resources developed.

Unexpected value has from time to time been found to

attach to what had been generally regarded as practically valueless products or weeds until some new process of manufacture in Europe, or an increased demand for substitutes for the better known and more expensive raw material of manufacture, gave them a value as exports. For instance, dura was held to be a drug on the market up to about 1904, when the rise in price of food grains in Europe combined with shortage of crops in Egypt caused the article to acquire a new value, with the result that in 1910 32,377 tons were exported. Senat seed is another instance; if this product could be produced in commercial quantities, it might be used in Europe as a substitute for the more expensive sesame seed, and sold at a good price. Again, the high price of Corossos nuts, and the invention of new machinery led in 1911 to the export of some £E16,000 worth of nuts from the dom palm for use in the manufacture of buttons. An even less apparently attractive article for export had been found in 1912 in the Sodom apple tree (*Calotropis procera*), the fibre from the stem of which had been valued at £E24 per ton, while a report showed that the floss from the pods of this plant is worth between 4*d.* and 5*d.* per lb. for use in textile manufactures. As this tree grows in large quantities in numerous districts, an income was apparently obtainable by the natives for the mere picking of the floss. Experiments were made to test the possibility of export on a commercial scale, but were unsuccessful.

Out of a total of some 14,000 tons of gum carried on the Kosti-El-Obeid railway in 1912, some 6,500 tons were consigned direct from El-Obeid to Port Sudan for export, while the local carryings of gum consigned to Khartoum and Omdurman amounted to about 8,000 tons. Although it was impossible to say what place was, or was likely to be, the headquarters of the trade, these statistics showed that there was an increasing tendency for gum to be exported abroad direct from near the place of production.

On two successive years there had been poor rainfall, and in 1913 there was another partial failure of rainfall, but the value of the external trade was practically the same in 1913

as in 1912. It amounted to £E3,457,767, a decrease of £E21,885.

Work on the Gezira Canal (see p. 375) had begun, but the general economic position remained as in 1912. The value of exports had decreased far less than might have been expected, while imports had actually increased in value. This total increase in imports amounted to an increase in value of £E142,347, of which the government importations, excluding specie, had risen in value by only £E7,786. The total of the purchases of cotton fabrics, sugar, coffee, tea, spices for 1913 was £E881,846, which was £E102,264 in excess of 1912.

The value of the transit and re-export trade had continued to increase. It amounted in 1913 to £E162,805, an increase of £E23,701. The continuous improvement in trade via Gambeila with South-West Abyssinia was partly responsible for this increase; there were practically no exports of Sudan produce by this route, the trade being a transit one. The total value of trade between the two countries in 1913 amounted to £E139,242, £E103,174 of which represented trade via Gambeila. Of the latter, goods in transit inwards were valued at £E31,803, and in transit outwards at £E26,589. The rest of the trade with Abyssinia was almost entirely via Kassala Province, and was valued at £E30,421. It was satisfactory to find that the trade via Gambeila had increased from £E72,756 in 1912 to £E103,174 in 1913.

The percentage of the value of exports was 56.1 per cent. of the value of imports. Imports from Egypt had increased by £E4,413 from 1912, amounting in 1913 to £E948,879. Exports to Egypt had fallen in value by £E118,722, or 18.9 per cent., amounting in 1913 to £E508,731. This decrease was attributable to the smaller number of cattle and sheep exported to Egypt, and to the fact that less cotton was now forwarded to Egypt since practically all ginning has been done in the Sudan. Imports from Great Britain had increased in 1913 to £E615,929, an increase of £E95,173, or 18.2 per cent. over 1912. This increase was partly due to increased imports of cotton piece-goods. Exports to Great Britain were practically

the same as in 1912, viz. £E268,375, as compared with £E268,255 in 1912. About half of the external trade of the Sudan was carried on via Egypt. India has a large share in the import trade of the Sudan. In 1912 it amounted to £E203,347, and in 1913 to £E232,024, an increase of £E28,677, or 14 per cent. This increase was due to importations of dura and larger importations of cotton goods.

In connexion with the question of the value and quality of Sudan products extensive inquiries had been made during the year as to the possibility of securing an improvement in the standard of quality of produce brought for sale into local markets, and draft legislation prepared to provide the necessary powers. The matter was being investigated owing to complaints made by local merchants as to the adulteration, either intentional or through negligence, of sesame and dura.

The tonnage of shipping entering and leaving Port Sudan in 1913 was 721,870 tons, as compared with 700,313 in 1912, an increase of 21,557 tons. The number of vessels calling was 314 as compared with 297 in 1912. British tonnage was practically the same as in the previous year, though the number of vessels of British nationality increased from 230 to 242, the tonnage being 527,845. The tonnage at Port Sudan had increased from 312,770 to 721,870.

Since the fall in prices at the end of 1912 the gum trade had pursued a quiet course. The highest price recorded in 1912 was P.T. 341 per 100 kilos (P.T. 167 per kantar). In 1913 the highest price was P.T. 251 per 100 kilos (P.T. 124 per kantar). Prices were at their lowest in May and June, viz. P.T. 205 to P.T. 208 per 100 kilos (P.T. 100 to P.T. 102 per kantar). After that prices rose gradually from P.T. 227 to P.T. 237 per 100 kilos (P.T. 112 to P.T. 116 per kantar). The best qualities of Gedaref Hashab sold at only P.T. 5 to P.T. 10 less per kantar than Hashab from Kordofan. Talh gum, which represents about one-tenth of the total export sold, as usual, at prices roughly one half of those of Kordofan Hashab. In the London market prices in 1913 for half hard sorts had varied from 30s. to 35s. per cwt.

During 1913 France was the only country that had increased its purchases of gum. Great Britain had taken 2,821 tons (1,507 tons less than in 1912), Germany 2,893 tons (1,368 tons less), the United States 2,175 tons (1,328 tons less), France 3,641 tons (340 tons more), other countries 3,665 tons (547 tons less).

In 1913, 4,785 tons, value £E21,097, of cotton seed were exported, an increase of 1,285 tons and £E5,278 over 1912 ; of ginned cotton 2,315 tons, value £E152,110, an increase of 702 tons and £E63,561, and of unginned cotton 39 tons, value £E387, a decrease of 2,998 tons and £E49,249. This shows the effect of the change caused by ginning cotton before export, since Egypt, the only market to which it paid to export unginned cotton in any quantity, is now closed except for steam pressing. The total quantity of cotton exported was thus 7,139 tons, and its total value £E173,594. There had thus been a slight increase, viz. £E18,590, in the value of cotton exported as compared with 1912, but the quantity of the crop had been less by 1,012 tons, or 12 per cent., accounted for by the poor rainfall in the Gezira. This year, 1913, was the first in which it was possible to give an estimate of the quantity of cotton lint exported, but in the following comparison it has to be remembered that the figures for 1911 and 1912 are approximate. For the last three years then, the export of cotton lint from the Sudan expressed in bales of 400 lb. had been : 22,823 for 1911, 15,000 for 1912, and 12,830 for 1913, a decrease as compared with 1912 of 2,170 bales. Of the cotton lint exported Egypt took 1,525 tons, Germany 14, Great Britain 775, and other countries 5.

Circumstances in 1913 were most unfavourable to the trade in live-stock and hides and skins, but the value of these exports fell only by £E35,556, the increase in the value of hides exported compensating to some extent for decrease in the number of cattle and sheep.

Sesame showed a total value of £E104,939, an increase of 745 tons, value £E15,850. The price of sesame was so high during the year as to be largely prohibitive of export to

Europe. The production of ground-nuts had again suffered from the poor rainfall. The total value of its export was £E9,198, a decrease of £E1,043.

There was a further decrease in the export of dom palm nuts. The local price of senna continued to rise. Sudan senna of good quality fetches a higher price on European markets than that imported from other countries.

The prices of ivory had been high during 1913. Less old ivory was now being exported. It was estimated that in 1912 one-quarter of the quantity exported consisted of old ivory. It is stated that about one-third of the export is soft ivory, and the remainder of the hard description. The latter is from the Sobat districts and the Uganda border, and sells for less than the soft ivory from Bahr el-Ghazal and the south-western districts. The export of ivory in 1913 was valued at £E113,236, an increase of £E18,771, the increase in quantity being 18 tons.

There was a slight decrease in the export of dates. It was satisfactory to note that under the concession granted for the working of the salt deposits at Raweiya, 4,601 tons had been extracted and landed at Port Sudan.

The stability of trade in 1913, in spite of two successive years of poor rainfall, is to be explained by the following facts : about three-quarters of Sudan exports are wild or semi-wild products which thrive under conditions of climate and rainfall rendering agriculture practically impossible. The comparative steadiness of imports was due to the proceeds of the sales of these natural products providing their collectors with means to purchase imports. It has also to be remembered that the largest employers of labour in the country are the government and the Egyptian army, a source of reliable income to a large and increasing number of people.

It will be seen from the following table, which shows the net imports and exports of specie, that until 1913 the Sudan had been absorbing specie at a rapid rate, considering the size of the population, many of whom still live under conditions which render money unknown or useless to them :



	<i>Net Imports.</i>	<i>Net Exports.</i>
	£E.	£E.
1908	91,472	—
1909	44,158	—
1910	126,078	—
1911	216,989	—
1912	291,816	—
1913	—	138,688

Evidently there had been a large increase in the circulation of money, and it could also be assumed that a considerable amount of imported specie had been hoarded, since, although credit had been restricted since the crisis of 1907, the value of imports had been maintained at practically the same level in spite of inferior harvests. The same table shows that a change in the movement of specie had taken place in 1913, since, so far from retaining a large balance, as had been usual, there had been a considerable net export of specie. This sudden fluctuation in specie movement was mostly attributable to the over-production of gum in 1912, large sums being required to finance the exports. In 1913 there was a reaction resulting from the existence of unconsumed stocks of gum on the European market and exports fell by a value of £E231,983, as compared with 1912. Consequently much less money was required to move the crop, and less money was retained by the native collector of gum.

The fact that Sudan trade had lost so little headway in spite of the adversities of the previous three years justified the expectation that the additional security regarding cultivation that would be given by the Gezira scheme when realized would finally dispose of the difficulties as to unequal distribution of the food supply bound to arise from time to time under the existing conditions. This consideration gave the Gezira project an additional attraction beyond what attached to it as a new source of wealth from the successful cultivation of cotton on a large scale.

Grain merchants had seized the opportunity of forcing up prices and the urban population had undoubtedly been feeling the pinch. The government, in order to avoid paying

exorbitant prices, was importing dura from India for sale to such of its own employés and others as could not be expected to cater for themselves.

Probably by this year the stores of surplus grain in the hands of the natives had been considerably reduced, and local scarcity was severely felt, but it was not safe to assume that because dura was three or four times its normal price that there was widespread hardship. The high price of the staple food had influenced the labour market and afforded a great stimulus to industry.

During the first half of 1914 the country was labouring under the severe handicap of a third successive deficiency in the annual rainfall, and in August, after the earlier part of the rainy season, when trade for the most part is necessarily inactive, came the outbreak of war. The country emerged not unsuccessfully from a time of great economic strain during which agriculture had been more or less at a standstill in some of the most productive districts, many of the people being in great want. Trade, in spite of everything, maintained a fair level, though naturally its value had shrunk considerably as compared with more prosperous times, and the country had continued to pay its own way. Further, notwithstanding the war, substantial progress was made towards recovery owing to the excellent harvest of 1914.

The rise in ocean freights, and the scarcity of shipping facilities at Port Sudan had greatly reduced the benefits likely to accrue from the year's good rainfall, but in 1915 the government had succeeded in arranging for a special steamer to load at Port Sudan.

Unfortunately owing to the war the completion of the Gezira irrigation scheme was delayed. No such drought as that of 1911-13 had been known in the Sudan for many years. The damage effected was cumulative, and the full effect was not felt until early in 1914. At the beginning of that year dura reached unprecedented prices. Thus, whereas the price of dura per 100 kilos, at Omdurman, was 375 mil- liemes in May 1909, 312 in May 1910, 323 in May 1911, it had

risen to 944 in May 1912, 782 in May 1913, and soared to 1,393 milliemes in May 1914. Since Omdurman is in close touch with large producing districts, this represents fairly accurately, though on a higher scale, the general trend of prices in a great part of the Sudan. But naturally the non-cultivating class were those most heavily affected. In spite of the drought crops of a kind were raised, and reserves of grain, if greatly exhausted, were still in existence, though these were not unearthed till the rains of 1914 were assured. Still even in certain cultivating districts there was a good deal of distress. In Dongola Province, for instance, the failure of the Nile flood was only one of a long series of accidents which temporarily ruined the more northerly parts of the province. In order to tide the people over to the next harvest the government imported 11,000 tons of dura from India, and another 16,000 tons were imported by merchants on their own account. This more than sufficed, as a certain surplus of this dura was afterwards re-exported. This importation from India made a great impression on native opinion, as affording a practical demonstration of the solicitude of the government for the welfare of the people. Most of this Indian dura was issued by government on loan at cost price on easy terms of repayment. It eked out the diminishing food supply, and the price at which it was sold largely prevented the exploitation of helpless people by local speculators. Prices were thus kept within limits reasonable considering the circumstances.

In years of good or normal harvest the Sudan produces far more dura than it can consume. As there is normally a large surplus remaining each year after the internal markets have been supplied, it follows that unless a scarcity of grain subsequently occurs dura becomes a drug in the market. If the larger part of the surplus dura cannot be exported each year prices fall, and remain unremunerative to the cultivator who, until brought up sharp again by the need of grain, will tend to neglect cultivation. The burying of grain until it is required at a time of want which may not occur for several

years to come is a most expensive form of banking, and much more uneconomic than the hoarding of gold, for the gold remains good whereas the dura perishes in time. It is essential, therefore, that a foreign market should be found for dura in the interests of agriculture and those dependent on it. In the years 1908-10 some 60,000 tons of dura had been exported, and the proceeds of the sale had stood the people in good stead during the last three years of poor crops. There appeared to be comparatively little difficulty in finding money for imports and grain even at the high prices prevailing. The urban population naturally desires very low prices for grain, as they feel the strain of high prices more than the rural population. But in the long run a foreign export of dura is also in their interest owing to the circulation of money which it causes, the demand for various kinds of labour, and the increased power of purchasing imports.

The impression was not uncommon that the high prices of 1913 and 1914 were largely the result of the exports of dura in 1909 and 1910, but there is no reason to suppose that prices, even if dura had not been exported, would not have been equally high in the towns after such exceptionally long and widespread droughts. So long as it is possible to deal with a shortage of supplies in towns by means of a comparatively small import such as that of 1914, or by internal arrangements for the regulation of the prices and movement of grain, it would be short-sighted to prohibit or restrict exports of dura in any year as a safeguard against a scarcity which might not arise for years, and which would then probably only affect a portion of the population. In 1914 different factors entered into the calculation, and it was necessary to scrutinize the export of dura very carefully, as it was important to maintain within the country itself an extra food reserve in case difficulty might arise in drawing upon outside markets.

When the Gezira scheme is in operation and the water supply for irrigation secure, the difficulties attendant upon periodic droughts in connexion with the grain supply for the

urban population will greatly diminish. Moreover, the cultivating class over a large area of the Gezira will then have a crop, cotton, which they can readily dispose of for cash, and the same importance will not attach to a foreign export of dura.

Other crops had also suffered from the bad rainfall and low Nile. None of the basins in Dongola province were flooded and hardly any wheat could be grown, and in Halfa, White Nile, and Berber Provinces seluka crops, sown on land exposed by the falling river, were poor, and sakia cultivation was only carried on under great difficulties. The Tokar cotton crop was much below normal, and the lack of grazing adversely affected the cattle trade.

With production at such a low ebb the rains in 1914 were anxiously awaited. They turned out to be exceptionally good. As soon as good crops were assured prices reverted almost immediately to the normal. Thus the price of dura per 100 kilos was 1,579 milliemes at Omdurman and 2,425 milliemes at Kassala in August, 1,090 and 2,425 milliemes respectively in September, falling to 617 and 983 milliemes in October, and 407 and 493 milliemes respectively in November.

The news of the outbreak of war came at the very time when people were beginning to feel confidence in an approaching improvement in the situation. So far as trade was concerned it produced little outward effect at first.

Until November the trade movements are small. The people are busy harvesting their grain; gum, the principal export, does not arrive on the market until December or January, and cotton, save for small quantities in the northern Sudan, is not picked until later.

So far as exports are concerned, therefore, it is permissible to compare the statistics during the first nine months of 1914, though these include two months of war. This comparison is shown in the table on p. 447.

From this it is seen that the value of exports declined from 1913 by £E184,325 during the first nine months of the respective years.

*Value of exports,  
Jan. 1 to Sept. 30.*

	£E.
1908 . . . . .	413,085
1909 . . . . .	563,922
1910 . . . . .	790,224
1911 . . . . .	1,202,840
1912 . . . . .	1,116,285
1913 . . . . .	1,007,494
1914 . . . . .	823,169

The last quarter of each year includes the period when the export trade is actively resumed after the rains. The following table shows the value of the exports during this quarter in the years 1908-14. It is noteworthy that in 1914 the value of exports was greater than in any of the preceding years except 1912, remarkable for an exceptional export of gum. Every effort had been made to get produce out of the country while opportunity offered.

*Value of exports,  
Oct. 1 to Dec. 31.*

	£E.
1908 . . . . .	102,853
1909 . . . . .	109,980
1910 . . . . .	187,397
1911 . . . . .	174,118
1912 . . . . .	256,834
1913 . . . . .	177,692
1914 . . . . .	197,091

Over the full twelve months of 1914 the total value of exports was £E1,020,260, a decrease of £E164,926 as compared with 1913.

Imports were at first but little affected by the war. The following table shows the value of imports during the first nine months of each year from 1908 to 1914 :

*Value of imports,  
Jan. 1 to Sept. 30.*

	£E.
1908 . . . . .	1,401,029
1909 . . . . .	1,333,249
1910 . . . . .	1,348,318
1911 . . . . .	1,709,193
1912 . . . . .	1,489,611
1913 . . . . .	1,601,887
1914 . . . . .	1,584,232

From this it is seen that during this period in 1914, as compared with the same period in the previous year, the value of imports showed a decrease of only £E17,655.

The value of public imports during this period was £E1,204,267, only £E20,304 less than for the same period of the preceding year, and, in fact, with the exception of that year, higher than in any previous year.

The following table shows the value of imports during the last three months of the years 1908-14. During the last quarter of the year 1914 there was a large decrease in the value of imports, caused by the doubt and uncertainty due to the war, difficulty of local importers in paying cash in advance in Europe for articles required to be imported, and the reduction of shipping facilities at Port Sudan. The table shows that whereas during the last quarter of 1914 the value of government imports was only £E15,664 less than in the same quarter of 1913, the value of public imports fell by no less than £E184,963.

					<i>Imports during the period</i>	
					<i>Oct. 1 to Dec. 31.</i>	
					<i>Government.</i>	<i>Public.</i>
					£E.	£E.
1908	.	.	.	.	194,370	297,399
1909	.	.	.	.	167,432	275,276
1910	.	.	.	.	234,739	348,369
1911	.	.	.	.	157,580	407,176
1912	.	.	.	.	112,661	365,157
1913	.	.	.	.	126,860	381,029
1914	.	.	.	.	111,196	196,066

The total value of imports, both government and public, in the twelve months of 1914 showed a decrease of £E218,282 as compared with 1913. During the whole twelve months the value of public imports fell by £E205,267.

The transit and re-export trade for 1914 was valued at £E144,776, a decrease of £E18,029 as compared with 1913. This trade is largely concerned with Abyssinia, that country accounting for £E64,365. The total trade of the Sudan with Abyssinia, valued at £E117,780, showed a decrease of £E21,462 as compared with 1913.

In 1914 imports through Egypt (value £E810,752) had decreased as compared with the twelve months of 1913 by £E130,351. The total value of imports through Great Britain was £E450,945, a decrease of £E138,282. These decreases were mainly attributable to reduced importations of cotton fabrics, coal, manufactured iron and steel, ironware, clothing, liquors and liqueurs. The value of imports from India on the other hand was £E333,058, an increase of £E101,034 due to the large importations of dura.

The value of exports to Great Britain was £E269,543, a slight increase of £E1,168, but the exports to Egypt fell in value to £E404,709, a decrease of £E104,022, mainly due to the smaller quantity of sesame exported. Exports to the United States were much the same as in 1913, viz. £84,795, a decrease of £E3,613.

The value of the exports for 1915 reached a total of £E1,577,991, an increase of 54 per cent. as compared with 1914, and 14 per cent. on the highest value hitherto reached, viz. £E1,376,958 in 1911. Another point of interest was that the value of exports in 1915 practically balanced that of imports. The total value of trade in 1915 was £E3,498,831, an increase on 1914 of £E442,301 or 14.4 per cent., and was only 7.4 per cent. less than in 1911. For this year the live-stock and hide and skin export became the leading export, the respective values of the four principal exports being :

	<i>Value of exports, 1915.</i>	<i>Percentage of value of exports to value of total imports.</i>
	£E.	.
Cattle, sheep, hides, and skins . . . . .	382,541	24
Gum . . . . .	313,081	20
Dura (and dukhn) . . . . .	255,172	17
Cotton and cotton seed . . . . .	270,372	17

Altogether 265,982 sheep and goat skins and 148 tons of hides were exported, the principal market being Italy. The total value was £E122,615, an increase of £E35,108.

The quantity of cotton lint exported was equivalent to 23,965 bales of 400 lb., as compared with only 9,435 bales in



1914. The maximum hitherto exported had been 22,823 bales in 1911. The value of the ginned cotton exported amounted to £E236,795, and of unginned cotton to £E203, increases over 1914 of £E138,240 and £E144 respectively. Whereas the value of the dura exported in 1914 was only £E4,429, it rose to £E207,156 (increase £E202,727). There was also a considerable export of dukhn (value £E68,016) which had not existed in 1914. The export of gum had diminished by £E838; it amounted to £E313,081. The export of sesame seed and oil and cotton seed had increased by £E57,659 to £E124,273. There was the considerable increase of £E17,557 in the value of senna exported, the total value being £E23,499. The ivory exported was valued at £E48,132, a decrease of £E36,473.

Imports on the whole were less than in 1914, but there were signs of returning prosperity on the part of the native. The import of cotton fabrics may be taken as a test. The value of these was £E481,773, an increase of £E138,551 on 1914.

In 1916 the total value of the external trade was £E5,254,087, an increase of £E1,755,256, or 50 per cent., on 1915. The total value of the exports was £E2,288,403, an increase of £E710,412. The total value of the public and private imports was £E2,661,468, an increase of £E1,957,218. The total value of government imports was £E755,907, or 28 per cent. of the total imports.

The Sudan continued to draw almost the whole of its imports from the Empire. The total value of the imports was 55 per cent. higher than in 1915, and of this total over 88 per cent. came from British territory, British imports having increased in value by 59.5 per cent.

The value of imports was greatly inflated by the rise in prices of commodities. At values ruling in 1913 imports in 1916 would have been worth only £E1,913,916, i.e. prices of imported goods had risen on an average about 32 per cent. Imports from Great Britain had increased from £E695,532 to £E1,072,490, an increase of 54 per cent. Larger importations of cotton goods accounted for much of this increase.

Imports of articles of Egyptian origin had increased from £E415,010 to £E592,049, or 43 per cent. The increase was spread over various items including sugar. Imports from India were of the value of £E475,760, an increase of £E210,261, or 79 per cent., on 1915. This increase was largely due to imports of cotton goods and flour. The increase in the value of imports from South Africa, viz. from £E26,811 to £E100,401, was the result of larger imports of coal. Cotton fabrics, sugar, coffee, tea, spices represented over 61 per cent. of public imports in 1916.

Imports of cotton fabrics increased by 761 tons in quantity and £E173,798 in value. A notable feature was the large purchases from India.

Exports in 1916 (£E2,288,403) surpassed all expectations. The increase over 1915 was no less than £E710,412, or 45 per cent. Exports to Egypt had increased by £E392,144, or more than 60 per cent. This was due to larger exports to Egypt of dura, camels, senna, and sesame. Direct exports to Great Britain, 28 per cent. of the total exports, had increased by £E262,405, or more than 67 per cent. This was mainly due to large exports of gum, and also to increases in the exports of hides and skins, ivory and senna. The exports to America had decreased in value by £E19,755.

In 1916 there was a decrease in the value of the export of live-stock and hides and skins as will be seen from the following table, which shows the respective values of the four principal exports from the Sudan in 1916 and their relation to the total value of exports :

	<i>Value of exports.</i>	<i>Percentage of value of imports to value of total exports.</i>	
	£E.	1916.	1915.
Gum . . . . .	586,102	26	20
Dura and dukhn . . . . .	425,318	19	17
Cotton . . . . .	308,200	13	17
Cattle, sheep, hides, and skins . . . . .	289,386	13	24

The number of cattle exported was 15,304, a decrease of 8,578 compared with 1915. The number of sheep exported was 74,051, a decrease of 13,679.

The re-export trade had increased by £E96,797, largely owing to re-exports of foodstuffs to Egypt and Arabia, which had increased by £E62,961 and £E23,131 respectively.

The recovery of the dura crop, the export of which amounted to the record quantity of 46,117 tons in 1915 and of 56,784 tons in 1916, had a most beneficial influence on the economic condition of the native much depressed by its previous vicissitudes. The demand, however, from such centres as Eritreä and the Hejaz was largely the result of war conditions, and the development of a permanent trade in dura with Great Britain would be of much greater value. Such a demand as existed from the United Kingdom was checked by the rise in prices caused by the Eritrean and Arabian demand. Inquiries show, however, that a good market for Sudan dura could be found in England, especially in the west. Dura has a high value as poultry food, especially in conjunction with other grains, and is also of use for feeding cattle and pigs. Merchants dealt before the war chiefly with dura from Burma, India, Syria, and Manchuria. The chief complaints against the Sudan variety are its dirtiness and its price. If an improvement in cleanliness and selection could be made a market could almost certainly be found in the United Kingdom, and the opening for dura overseas generally should remain good for years to come. Unfortunately there are great fluctuations in the output, and the trade would be liable to sudden interruptions.

The large export trade in sesame that has grown up bids fair to become one of the chief staple industries, there always being a much greater demand than supply. The difficulties in the disposal of the cotton crop caused by the war were overcome by the Government, for whom the Sudan Plantation Syndicate supported by the British Cotton-growing Association acted as agents. The cultivator received cash on the spot for his cotton.

The ivory trade, which had been steadily increasing, was adversely affected by the war but remained better than had been expected. Whereas in 1902 the value of the trade was

only £E34,701, it had risen to £E113,236 in 1913, to fall in 1914 to £E84,605, and in 1915 to £E48,132, but rose again in 1916 to £E70,234.

The dates exported from the Sudan go mainly to Egypt ; in 1916, however, a sample sent to England was classed with Persian dates, of which from 500,000 to 700,000 boxes containing 70 lb. each are annually imported. It thus appears that the Sudan date ought to find a market in Europe when cultivation extends sufficiently to admit of export. The export was worth £E42,754 in 1911, but declined steadily to £E24,167 in 1915, rising again to £E43,693 in 1916.

The war provided openings for the live-stock trade which had not previously existed, and importers in Great Britain, France, and Italy have shown considerable interest. The Sudan ought to have an opportunity to profit from assisting to make good deficiencies in live-stock caused by the war.

The value of the export in live-stock, hides, and skins as noted in 1915 exceeded that of any other export, gum being for the first time displaced from the position of principal export. Fewer cattle were exported in 1916 owing to disease. The principal destinations of live-stock, &c., in 1913-15 were :

	1913.	1914.	1915.
	<i>Units.</i>	<i>Units.</i>	<i>Units.</i>
Egypt . . .	10,255	10,405	20,318
Malta . . .	275	883	3,010
Tripolitana . .	—	—	475

With better shipping facilities the export to Malta would have advanced still more.

It is estimated that the Sudan is capable of an annual output of 45,000-50,000 head of an average weight of 340 kilos giving about 181 kilos of meat. The sheep exported weigh approximately 55 kilos.

The export of untanned hides developed considerably during the war, a large export going to Italy and Eritrea to meet military requirements ; the total value exported in 1915 was £E122,615, and in 1916 it was £E110,845 as compared with £E87,507 in 1914.

A field which offers good possibilities is the tanning industry. Had a tannery capable of producing good leather been in operation before the war, it would have had great opportunity during its continuance. So far no tanning projects have had any success, but it is to be hoped that the necessary capital and enterprise will yet appear. A considerable amount of tanning is done by native methods. There has been a demand for the pods of the *Acacia arabica* for use in tanning.

The trade in ostrich feathers is steadily declining. It was worth £E15,170 in 1910, and had sunk to £E4,583 in 1913. South African feathers are superior, and as the exportation of South African ostriches is prohibited, it would take many years to improve the breed in the Sudan sufficiently to compete in the European feather markets, while the demand for ostrich feathers in general has abated. Sudan feathers fetch too small a price on European markets to make the trade sufficiently remunerative, though their value could be improved by better grading. The native does not understand ostrich-farming well.

A considerable industry arose in Berber province in connexion with the manufacture of mats from dom palm leaves exported in large numbers for military purposes. There was during the war a large increase in the output of charcoal to Egypt. The vicissitudes of the drug market led to a strong demand for senna, datura, henbane, and colocynth, all of which can be obtained in considerable quantities in the Sudan. Large numbers of camels were exported to Egypt and elsewhere for military purposes, over 12,000 being exported in 1916.

The value of the external trade for the three years 1914-16 was £E11,809,448 as compared with a value of £E10,716,945 for the three preceding years, an increase of £E1,092,803, or 10 per cent. It could not be said, therefore, that the trade of the Sudan was suffering seriously from the war, although it had been considerably hampered at the commencement of hostilities.

Thus trade had been making a great advance towards equilibrium during 1915-16.

The Sudan rendered considerable service during the war in supplying grain, camels, cattle, and dates to the forces in Egypt, and the country reaped much benefit thereby, except that the export of camels rendered transport difficult in some districts. There was a large increase in British trade, the value of the exports to British territory rising in 1916 to £E1,718,198, 75 per cent. of the total exports. Imports from British territory in the same year increased over 59 per cent. in value, viz. to £E2,241,888. These represented increases as compared with 1915 of £E640,693 and £E836,399 respectively.

In 1917 there was a large increase in the value of exports compared with 1916, amounting to £E1,202,000, or 53 per cent. The value of imports exceeded that in 1916 by £E440,649, or 17 per cent. The excess of exports over imports was £E627,064. Notwithstanding war conditions the principal exports, with the exception of sheepskins, sesame, and ivory, were well above the average of the preceding six years. The exports of cattle and sheep, groundnuts and millet were considerably above the previous maxima. In 1917 the Sudan was able to ship practically all produce available for export. Egypt had been a large purchaser of Sudan produce, exports to Egypt being of the value of £E2,589,541 as compared with £E1,045,250 in 1916, an increase accounted for by the great increase in export of food-grains, cattle, &c. It was found necessary to tariff some of the principal foodstuffs. The export of gum arabic, still the chief export, was satisfactory, amounting to 16,613 tons, as compared with 19,615 tons in 1912, the maximum exported in any previous year. The year was one of the best ever experienced in the Sudan cotton-growing industry, exports of ginned cotton being 4,168 tons as compared with 4,305 tons in 1915, the highest pre-war export. Prices were roughly double those of 1915. The Tokar crop was one of the best on record. Although the value of imports had increased, the quantities of the important articles imported in 1917 were, with a few exceptions, less than in 1916.

The cultivation of food-grains had been stimulated as much

as possible. In 1916-17 wheat cultivation was increased by some 10,000 acres, and in 1917-18 wheat, maize, and barley cultivation by some 9,000 acres.

British trade with the Sudan continued to increase in value. In 1917 exports to British territory were of the value of £E3,319,284, representing 95 per cent. of the total value of exports as compared with 75 per cent. in 1916. Imports from British territory were 91 per cent. of the total value of imports as compared with 88 per cent. in 1916. Great Britain continued to provide the principal market for Sudan gum.

The export of dura in 1917 amounted to 84,779 tons, by far the largest quantity exported in any one year. During the years 1915-17 187,504 tons of dura had been exported as compared with 3,408 tons in the years 1912-14, when the country suffered from drought. In the last period of plenty, 1909-11, the quantity was 72,523 tons. It will be observed how greatly the output of the country had increased. At the same time it was a matter of anxiety to avoid depleting food-reserves unduly by exportation.

## STATISTICS

### *General*

The growth and fluctuations of trade are shown in the table on p. 457. The imports brought in by the public are distinguished in that table from those brought in on behalf of the government, and the percentage of government imports of the total value of imports is added to the government total.

The following table shows the total annual value of external trade since 1907, exclusive of specie. The value in 1916 was 50 per cent. greater than in 1915, the actual increase being £E1,755,256 :

	£E.		£E.
1907 . .	2,135,004	1913 . .	3,457,767
1908 . .	2,478,723	1914 . .	3,056,530
1909 . .	2,541,422	1915 . .	3,498,831
1910 . .	3,013,433	1916 . .	5,254,087
1911 . .	3,779,526	1917 . .	6,889,443
1912 . .	3,479,652		

The value of the external trade for the three years 1914–16 was £E11,809,448, as compared with a value of £E10,716,645 for the three preceding years, an increase of £E1,092,803 or 10 per cent. The value in 1917 exceeded that of 1916 by £E1,635,356, an increase of 31 per cent.

GENERAL STATEMENT OF VALUE OF THE EXTERNAL TRADE  
OF THE SUDAN DURING THE YEARS 1907–17.

Year.	<i>Imports.</i>		<i>Mer- chandise in transit inwards.</i>	<i>Exports.</i>	<i>Re- Exports.</i>	<i>Mer- chandise in transit out- wards.</i>
	<i>Public. Total.</i>	<i>Govern- ment total and per- centage.</i>				
	£E.	£E.	£E.	£E.	£E.	£E.
1907	916,243	687,894 or 43 %	10,281	449,329	49,015	22,242
1908	1,183,054	709,744 or 38 %	3,623	515,938	37,079	29,285
1909	1,119,072	656,885 or 37 %	6,913	673,902	60,941	23,709
1910	1,213,915	717,511 or 37 %	16,092	977,621	57,958	30,336
1911	1,508,974	764,975 or 34 %	22,723	1,376,958	74,894	31,002
1912	1,471,039	496,390 or 25 %	22,032	1,373,119	92,657	24,415
1913	1,605,600	504,176 or 24 %	34,506	1,185,186	93,655	34,644
1914	1,400,333	491,161 or 26 %	22,065	1,020,260	87,986	34,725
1915	1,359,364	344,886 or 20 %	56,267	1,577,991	130,315	30,008
1916	1,905,561	755,907 or 28 %	43,796	2,288,403	227,112	33,308
1917	2,195,777	906,340 or 29 %		3,490,565	238,616	
1918	3,036,403	988,179		3,923,771	286,613	
1919	3,000,947	1,804,798		2,740,759	288,810	



*Imports*

Owing to the outbreak of war imports decreased in 1914-15 partly owing to the reduced purchasing power of the country consequent on the bad years 1911-13, and partly owing to the difficulties arising out of the war itself. The value of imports of articles in native demand, such as cotton fabrics, sugar, coffee, tea, spices, also decreased; but in 1916 and 1917 the value of imports had risen considerably. The war had little effect on the distribution of the import trade, the tendency being to strengthen the connexion between the Sudan and British sources of supply. Before the war imports from enemy countries had been very small, those from Germany, Austria-Hungary, and Turkey only amounting in 1913 to £E121,033. The principal Austrian import, sugar, is now obtained from Egypt. Owing to the condition of trade in Abyssinia additional supplies of Maria Theresa dollars, used in trading with Abyssinia and obtained from Austria have not been required in such large quantities, but the stoppage of the supply, combined with hoarding of dollars in Abyssinia caused some inconvenience in the Gambeila trade.

The following table shows how the Sudan continued to draw almost the whole of its imports from the Empire during 1914-17:

<i>Imported from</i>	<i>1914.</i> £E.	<i>1915.</i> £E.	<i>1916.</i> £E.	<i>1917.</i> £E.
British territory (including Egypt) . . . .	1,443,105	1,405,489	2,241,888	2,659,390
Allied . . . . .	143,201	79,315	68,260	205,134
Neutral . . . . .	99,795	122,834	173,282	137,603
Enemy (from Hejaz, Arabia) . . . . .	103,037	10,054	29,567	—
Countries not specified . . . . .	10,655	7,915	22,518	77,094
<b>Total . . . . .</b>	<b>1,799,793</b>	<b>1,625,607</b>	<b>2,535,515</b>	<b>3,079,221</b>

The following table indicates the increase of prosperity among the native population. All the items included appeal strongly to popular taste. The value of these imports has tended to rise considerably.

<i>Import.</i>	<i>1909.</i>	<i>1910.</i>	<i>1911.</i>	<i>1912.</i>
	£E.	£E.	£E.	£E.
Cotton fabrics	372,364	420,945	580,697	412,693
Sugar . . .	151,571	185,480	198,960	257,866
Coffee . . .	45,247	39,791	55,364	64,532
Tea . . .	16,584	24,442	32,914	34,655
Spices . . .	8,766	8,043	9,585	9,836
<b>Total</b> . . .	<b>594,532</b>	<b>678,701</b>	<b>877,520</b>	<b>779,582</b>

<i>Import.</i>	<i>1913.</i>	<i>1914.</i>	<i>1915.</i>	<i>1916.</i>	<i>1917.</i>
	£E.	£E.	£E.	£E.	£E.
Cotton fabrics	503,616	343,222	481,773	655,571	779,783
Sugar . . .	258,750	239,076	226,256	330,150	409,555
Coffee . . .	67,545	57,319	79,201	115,938	147,682
Tea . . .	39,114	36,502	34,573	51,375	75,167
Spices . . .	12,821	8,209	11,083	12,855	16,320
<b>Total</b> . . .	<b>881,846</b>	<b>684,328</b>	<b>832,886</b>	<b>1,165,889</b>	<b>1,428,507</b>

The following table shows the percentage of cotton fabrics supplied by each country for the two years 1913 and 1917 :

	<i>Percentage.</i>	<i>1913.</i>	<i>1917.</i>
Egypt . . .	. . .	51	59·5
Great Britain . . .	. . .	28	8·5
Italy . . .	. . .	10	1·5
India . . .	. . .	8	30·5
Other countries . . .	. . .	3	—

Cotton piece goods coming from Egypt, however, are entirely of foreign origin, as the Sudan finds it most convenient to buy from Egyptian importing agents. If the table of percentages were based on the countries of ultimate origin it would have to be reconstructed as follows :

	<i>Percentage.</i>	<i>1913.</i>	<i>1917.</i>
Great Britain . . .	. . .	62	64
Italy . . .	. . .	27	6
India . . .	. . .	8	30
Other countries . . .	. . .	3	—

## QUANTITY, AND AVERAGE QUANTITY, OF PRINCIPAL IMPORTS, 1909-13

<i>Articles.</i>	<i>Units of weight.</i>	<i>1909.</i>				<i>1911.</i>				<i>1912.</i>				<i>Average, 1909-13.</i>
Horses, donkeys, mules, and camels . . . . .	Units	5,223	3,575	3,716	2,373	1,593								3,293
Butter and ghee . . . . .	Tons	133	198	198	214	211								191
Candles . . . . .	"	133	173	221	186	187								180
Wheat . . . . .	"	304	445	480	2,600	1,727								1,111
Dura and dukhn . . . . .	"	—	—	—	6,326	7,759								—
Rice . . . . .	"	1,241	1,844	2,235	3,187	2,546								2,210
Flour (wheat). . . . .	"	5,367	4,842	7,510	8,272	7,904								6,779
Sugar (refined) . . . . .	"	9,230	10,836	11,833	13,768	16,066								12,346
Coffee . . . . .	"	1,159	1,117	1,350	1,739	1,657								1,404
Tea . . . . .	"	294	434	547	543	628								489
Petroleum . . . . .	{ Tons Cases	348	157	283	150	213								230
Coal . . . . .	Tons	33,314	58,650	51,031	56,489	65,892								53,075
Natural salt . . . . .	"	68,355	66,026	61,096	73,575	73,064								68,423
Common soap . . . . .	"	2,150	2,826	3,850	5,745	3,781								3,670
Cotton fabrics . . . . .	"	753	881	1,049	938	956								915
Empty sacks . . . . .	"	3,047	3,122	4,370	3,107	3,820								3,493
Iron and steel (manufactured) . . . . .	"	1,490	1,532	1,572	1,188	1,282								1,213
	"	16,662	23,736	16,903	2,889	5,555								13,149

## VALUE, AND AVERAGE VALUE, OF PRINCIPAL IMPORTS, 1909-13

Articles.	1909.				1910.				1911.				1912.				1913.				Average, 1909-13.
	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.	
Horses, donkeys, mules, and camels	19,455	17,782	19,019	14,618	10,807	10,336															
Bullocks and cows	5,207	5,175	2,963	4,434	1,097	3,775															
Butte and ghee	7,428	10,026	11,617	11,424	10,889	10,277															
Candles	5,405	6,975	9,278	7,408	7,673	7,348															
Wheat	2,716	3,775	4,358	23,009	15,654	9,902															
Dura and dukhn	—	—	—	51,576	58,193	—															
Rice	11,205	14,365	17,829	28,683	25,049	19,426															
Flour (wheat)	66,901	55,590	77,005	87,699	86,168	74,666															
Sugar (refined)	151,571	185,480	198,960	257,866	258,750	210,525															
Coffee	45,247	39,791	55,364	64,532	67,545	54,496															
Tea	16,584	24,442	32,914	34,655	39,114	29,542															
Liquors and liqueurs	22,819	19,708	24,210	20,185	29,030	23,190															
Petroleum	9,359	11,390	10,254	11,452	15,770	11,645															
Timber	110,648	158,442	152,137	23,125	29,016	94,673															
Coal	74,224	72,926	74,343	99,876	108,037	85,881															
Natural salt	3,378	3,669	4,753	7,357	4,967	4,825															
Common soap	18,132	21,753	27,395	26,982	28,536	24,559															
Perfumery	20,716	18,862	23,145	13,246	10,659	21,326															
Cotton fabrics	372,364	420,945	580,697	412,693	503,616	458,063															
Empty sacks	29,506	29,880	29,950	26,003	29,815	29,013															
Ready-made underclothing	—	—	18,561	44,752	7,775	40,139															
Ready-made clothing	31,312	39,995	24,792	—	33,508	—															
Iron and steel (manufactured)	154,797	157,750	125,287	31,197	50,327	103,871															
Ironware	24,288	30,242	29,136	32,489	38,656	30,962															
Arms and parts of arms	14,644	11,514	8,678	6,433	9,488	10,151															
Machinery and parts of machinery	32,199	26,895	32,758	26,834	23,635	28,464															

QUANTITY, AND AVERAGE QUANTITY, OF PRINCIPAL IMPORTS,  
1914-16

<i>Articles.</i>	<i>Units and Weights.</i>	<i>1914.</i>	<i>1915.</i>	<i>1916.</i>	<i>Average. 1914-16.</i>
Horses, donkeys, mules, and camels . . . .	Units	792	409	914	705
Butter and ghee . . . .	Tons	176	132	127	145
Candles . . . . .	"	176	113	177	155
Wheat . . . . .	"	3,779	1,626	554	1,986
Dura, dukhn, & maize . .	"	27,345	595	243	9,394
Rice . . . . .	"	3,127	1,219	1,647	1,998
Flour (wheat) . . . . .	"	9,481	5,503	6,752	7,245
Sugar (refined) . . . . .	"	14,931	10,845	11,991	12,589
Coffee . . . . .	"	1,488	1,685	2,815	1,996
Tea . . . . .	"	548	418	574	513
Petroleum . . . . .	{ Tons	130	196	244	190
Coal . . . . .	{ Cases	35,386	43,814	43,953	41,051
Natural salt . . . . .	Tons	55,358	41,779	70,695	55,944
Common salt . . . . .	"	934	1,632	1,149	1,238
Cotton fabrics . . . . .	"	887	885	975	916
Sacks . . . . .	"	2,963	4,091	4,852	3,969
Iron and steel (manu- factured) . . . . .	"	538	2,404	2,274	1,739
		2,672	3,534	908	2,371

## VALUE, AND AVERAGE VALUE, OF PRINCIPAL IMPORTS, 1914-16

<i>Articles.</i>	<i>1914. £E.</i>	<i>1915. £E.</i>	<i>1916. £E.</i>	<i>Average. £E.</i>
Horses, donkeys, mules, and camels . . . . .	6,326	3,797	14,302	8,142
Bullocks and cows . . . .	378	717	1,524	873
Butter and ghee . . . . .	9,890	8,029	9,348	9,089
Candles . . . . .	7,335	5,153	10,254	7,581
Wheat . . . . .	39,466	16,463	6,216	20,715
Dura and dukhn . . . . .	214,197	4,175	1,752	73,375
Rice . . . . .	29,805	12,390	20,749	20,981
Flour (wheat) . . . . .	102,352	74,716	90,499	89,189
Sugar (refined) . . . . .	239,076	226,256	330,150	265,161
Coffee . . . . .	57,319	79,201	115,938	84,153
Tea . . . . .	36,502	34,573	51,375	40,817
Liquors and liqueurs . . .	32,911	19,835	40,474	31,073
Petroleum . . . . .	11,191	11,723	22,240	15,051
Timber . . . . .	25,369	26,532	12,494	21,465
Coal . . . . .	76,222	81,030	291,853	149,701
Natural salt . . . . .	1,416	2,496	2,105	2,006
Common soap . . . . .	24,498	24,371	31,993	26,954
Perfumery . . . . .	1,745	3,048	2,420	2,404
Cotton fabrics . . . . .	343,222	481,773	655,571	493,522
Sacks . . . . .	14,097	63,324	74,299	50,573
Ready-made underclothing .	29,641	26,002	30,615	28,753
Ready-made clothing . . .				
Iron and steel (manufactured)	24,767	28,404	15,207	22,793
Ironware . . . . .	20,185	10,172	10,383	13,580
Arms and parts of arms . .	3,730	1,781	2,260	2,590
Machinery and parts of same .	27,710	9,388	20,131	19,076

STATEMENT OF QUANTITIES AND VALUE OF PRINCIPAL  
IMPORTS IN 1917

<i>Articles.</i>	<i>Units.</i>	<i>Quantity.</i>	<i>Value.</i> £E.
Horses, donkeys, mules, and camels . . . . .	Units	637	4,876
Cotton fabrics . . . . .	Tons	3,990	779,783
Empty sacks . . . . .	"	2,444	110,113
Clothing, underclothing, and hosiery . . . . .	Value	—	45,197
Carpets, woollen blankets, and rugs . . . . .	Units	27,020	11,770
Cordage and cables . . . . .	Tons	102	12,800
Cotton yarn and sewing cotton . . . . .	Value	—	6,819
Cotton covers . . . . .	Units	43,435	6,634
Silk fabrics . . . . .	Metres	16,306	2,294
Butter . . . . .	Kilos	110,000	11,121
Sugar . . . . .	Tons	11,146	409,555
Coffee . . . . .	"	3,388	147,682
Flour . . . . .	"	3,286	66,829
Tea . . . . .	"	669	75,167
Rice . . . . .	"	1,276	25,258
Spices and pepper . . . . .	"	329	25,646
Jams and confectionery . . . . .	"	229	13,323
Preserved vegetables and fruit . . . . .	Value	—	4,915
Bread, biscuits, and cakes . . . . .	Tons	411	8,756
Wheat and corn . . . . .	"	257	5,391
Liquors and liqueurs . . . . .	Quarts	181,658	19,677
Beer, ale, and stout . . . . .	"	183,116	8,299
Wine and champagne . . . . .	"	43,896	3,694
Coal . . . . .	Tons	60,821	318,590
Petroleum . . . . .	{Cases	36,197	16,792
	{Tons	273	4,139
Benzine, gasolene, and methylated spirits . . . . .	"	646	14,549
Essential and volatile oils . . . . .	"	43	15,560
Soap . . . . .	"	1,061	42,227
Candles . . . . .	"	62	5,037
Matches . . . . .	Value	—	3,250
Chemicals and drugs . . . . .	"	—	21,523
Skins and hides, saddlery and leather goods . . . . .	"	—	15,169
Boots and shoes . . . . .	Pairs	35,998	14,995
Machinery (including steam engines, motor cars, &c.) . . . . .	Value	—	50,022
Finished iron and steel . . . . .	"	—	60,079
Paper and printed matter . . . . .	"	—	18,684
Tobacco, tobac, cigars, and cigarettes . . . . .	Kilos	226,000	68,117

VALUE OF IMPORTS FROM PRINCIPAL COUNTRIES FOR  
THE YEARS 1908-13

<i>Country.</i>	<i>1908.</i>	<i>1909.</i>	<i>1910.</i>	<i>1911.</i>	<i>1912.</i>	<i>1913.</i>
	£E.	£E.	£E.	£E.	£E.	£E.
Abyssinia .	27,070	32,403	37,042	57,509	64,702	65,608
Australia .	47,410	51,357	135,950	112,504	—	49
Austria .	26,950	21,176	23,368	48,999	26,468	35,196
Belgium .	15,352	9,804	14,629	8,964	11,935	12,127
Brazil .	—	—	—	4,065	166	1,598
Congo .	—	—	—	372	79	245
Egypt .	906,059	807,527	874,763	902,513	944,466	948,879
Eritrea .	22,545	19,242	23,623	15,931	21,020	12,185
France .	11,664	12,525	11,635	17,611	11,377	11,225
Great Britain	613,135	600,702	600,370	793,416	520,756	615,929
Germany .	27,916	37,300	17,563	24,503	20,023	20,166
Greece .	—	—	—	2,177	2,172	2,145
Holland .	—	—	—	3,587	4,954	5,586
India & Aden	102,458	91,638	108,715	155,049	203,347	232,024
Italy .	12,422	15,261	18,550	56,219	43,637	61,590
Roumania .	—	—	—	3,921	8,151	1,232
Russia .	—	—	—	12,035	6,731	12,548
Spain .	—	—	—	70	646	219
Sweden .	—	—	—	1	8	4,023
Turkey .	—	9,658	7,701	8,830	6,451	4,943
United States	28,697	13,862	3,552	2,260	8,461	8,660
Uganda .	—	—	—	2,178	248	25
<b>Total</b>	<b>1,841,678</b>	<b>1,722,455</b>	<b>1,877,461</b>	<b>2,232,714</b>	<b>1,905,798</b>	<b>2,055,302</b>

SOURCE OF SOUDAN IMPORTS IN 1918

	<i>Percentage.</i>
Great Britain . . . . .	29
Egypt . . . . .	30
India and Aden . . . . .	16
South Africa . . . . .	8
Abyssinia . . . . .	5
Eritrea . . . . .	1
Italy . . . . .	5
Japan . . . . .	1½
Other countries . . . . .	4½

It is an indication of the greatly increased prosperity of the native that whereas in 1914 imports of cotton fabrics, sugar, coffee, tea and spices, were valued at £E684,320, the value of these imports in 1918 was no less than £E2,062,631.

VALUE OF IMPORTS FROM PRINCIPAL COUNTRIES FOR  
THE YEARS 1914-17<sup>1</sup>

*Showing goods of Egyptian origin.*

	1914.	1915.	1916.	1917.
Abyssinia . . . .	££52,006	££33,376	££76,250	££114,661
Austria <sup>2</sup> . . . .	53,752	1,959	75	4
Australia . . . .	2,215	96	—	—
Brazil . . . . .	8,669	41,274	46,017	180
Belgium . . . . .	17,808	962	282	38
Ceylon . . . . .	2,523	2,541	1,188	4,736
D. E. Indies . . . .	1,076	5,719	484	8,192
Egypt <sup>3</sup> . . . . .	493,283	415,010	592,049	791,331
Eritrea . . . . .	5,272	12,326	12,594	25,369
France . . . . .	23,129	9,175	15,132	26,705
Great Britain . . . .	580,233	695,532	1,072,490	1,190,364
Germany . . . . .	30,991	627	324	3
Greece . . . . .	7,925	6,813	6,993	3,424
Holland . . . . .	5,846	2,558	3,296	985
India and Aden . . . .	364,829	265,499	475,760	562,944
Italy . . . . .	71,021	54,920	39,846	73,664
Russia . . . . .	25,971	1,932	3	171
Roumania . . . . .	6,888	2,009	404	—
Sweden . . . . .	7,409	12,044	16,099	7,523
Turkey, North . . . .	16,535	4,059	112	—
Turkey, South (Arabia)	1,759	3,409	29,056	19,004
Union of S. Africa . .	22	26,811	100,401	156,550
U. S. America . . . .	9,976	19,041	24,143	6,928
Other countries . . . .	10,655	7,915	22,518	30,819
Total . . . . .	1,799,793 <sup>4</sup>	1,625,607 <sup>4</sup>	2,535,515 <sup>4</sup>	3,023,595

INDEX NUMBER OF PRICES OF CERTAIN ARTICLES

*At Khartoum for November 1919 as compared with the pre-war standard of prices.*

Classification.	Pre-war Standard.	Average Price in November 1919.	Classification.	Pre-war Standard.	Average Price in November 1919.
Dura . . . . .	100	281	Wheat flour . . . .	100	373
Butter (Samn) . . . .	100	234	Tea . . . . .	100	225
Mutton . . . . .	100	171	Sugar (quality Ras <sup>5</sup> ) . . . . .	100	344
Beef . . . . .	100	167	Cotton fabrics . . . .	100	368
Coffee (Abyssinian)	100	204	Petroleum . . . . .	100	381
Rice . . . . .	100	300			

<sup>1</sup> The value of imports shown for each country includes goods from that country which have entered the Sudan via Egypt. The total for Egypt, therefore, represents only goods of Egyptian origin.

<sup>2</sup> Stocks imported into Egypt before the War.

<sup>3</sup> Excludes goods imported from foreign countries into the Sudan via Egypt.

<sup>4</sup> Excluding tobacco, &c., and various, viz. parcel post direct, parcel post from Egypt, and goods cleared through passengers' office.

SUDAN

H h



*Exports*

In 1915, if the value of re-exports (££130,215) be included in that of exports, the total value exceeds that of imports, the respective totals being :

	£ E.
Exports and Re-exports . . . . .	1,708,306
Imports . . . . .	1,704,200

This was the first year in which the trade balance reached such a satisfactory level. Import values had declined 9 per cent. and export values had risen 34 per cent.

Since 1908 the ratio between gross imports and exports has been as follows :

In 1908 the value of exports was 27·2 per cent. of the value of imports.

1909	"	"	37·9	"	"
1910	"	"	50·6	"	"
1911	"	"	60·5	"	"
1912	"	"	69·7	"	"
1913	"	"	56·1	"	"
1914	"	"	53·9	"	"
1915	"	"	90·2	"	"
1916	"	"	85·9	"	"
1917	"	"	88·0	"	"

The principal articles of export were for long gum, ivory, ostrich feathers. Gum (except for 1915) remains the leading export ; the trade in ostrich feathers is now negligible, however, while that in ivory has been affected by the war. Meanwhile the exports of cotton, live-stock, hides, and skins, as also of dura, have become important, and promise to become more so. In 1915 live-stock and hides were the principal export.

The importance of the gum trade will be seen from the following table, which shows how the value of gum compares with the total value of exports.

	<i>Per cent. of total value of exports.</i>		<i>Per cent. of total value of exports.</i>
1906 . . .	36	1912 . . .	43
1907 . . .	34	1913 . . .	31
1908 . . .	33	1914 . . .	31
1909 . . .	29	1915 . . .	20
1910 . . .	22	1916 . . .	26
1911 . . .	31	1917 . . .	21

Great Britain has greatly increased her takings of gum, as will be seen from the following table, which shows the export of gum to the principal countries from 1912 to 1917, taking into account gum re-exported from Egypt :

	1912.	1913.	1914.	1915.	1916.	1917.
	M. tons.	M. tons.	M. tons.	M. tons.	M. tons.	M. tons.
Great Britain .	4,328	2,821	2,636	4,923	7,388	8,407
Germany .	4,211	2,983	2,078	—	—	—
U. S. America .	3,503	2,175	2,338	2,031	1,025	703
France .	3,301	3,641	3,100	3,449	3,845	5,617
Italy .	475	511	406	369	329	879
Other countries .	3,797	2,998	1,814	843	893	1,007
Total .	19,615	15,129	12,372	11,615	13,480	16,613

The following tables show the quantity and value of the exports of cotton, lint, and seed, for the years 1911-17 :

Year.	Seed.		Ginned cotton.		Unginned cotton.		Total.
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Value.
	M. tons.	£E.	M. tons.	£E.	M. tons.	£E.	£E.
1911 .	7,105	31,583	3,044	195,272	2,181	40,574	267,429
1912 .	3,501	15,819	1,617	88,549	3,040	50,636	155,004
1913 .	4,785	21,097	2,315	152,110	39	387	173,594
1914 .	3,012	12,509	1,712	98,555	5	59	111,123
1915 .	8,244	33,376	4,305	236,795	22	203	270,372
1916 .	8,165	39,106	2,941	269,093	27	253	308,452
1917 .	7,550	45,878	4,168	564,303	82	930	611,111

Calculated in bales of 400 lb. the quantity of lint exported has been as follows :

Bales of 400 lb.		Bales of 400 lb.	
1911 .	22,823	1916 .	16,219
1912 .	15,000	1917 .	22,971
1913 .	12,830	1918 .	11,263
1914 .	9,435	1919 .	12,325
1915 .	23,965		

The importance of Egypt to the Sudan as a market for cotton will be seen from the following table :

#### EXPORTS OF GINNED COTTON

	1913.	1914.	1915.	1916.	1917.
	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.
To Egypt .	1,522,498	902,284	1,805,556	1,402,670	2,485,040
Great Britain .	774,189	808,720	2,482,921	1,534,270	1,682,973
Other countries .	18,421	494	16,354	4,223	—
Total .	2,315,108	1,711,698	4,304,831	2,941,163	4,168,013

QUANTITY AND VALUE OF EXPORTS OF GUM, IVORY, COTTON, AND DURA FOR THE YEARS  
1899-1917

(Prior to 1907 the figures given are approximate only)

Year.	Gum.		Ivory.		Cotton (including seed).		Dura.	
	Quantity. M. tons.	Value. £E.	Quantity. M. tons.	Value. £E.	Quantity. M. tons.	Value. £E.	Quantity. M. tons.	Value. £E.
1899 .	1,890	Not given	—	—	—	—	—	—
1900 .	2,745	"	—	—	—	—	—	—
1901 .	7,695	178,531	15	7,925	1,200	13,000	—	—
1902 .	9,900	268,878	57	34,701	150	1,400	—	—
1903 .	8,065	192,920	49	29,826	1,100	21,000	828	5,216
1904 .	11,816	179,481	64	43,195	1,800	41,000	619	4,176
1905 .	7,110	113,131	76	51,326	2,000	34,000	27	303
1906 .	7,290	96,000	50	37,017	2,300	50,000	2,588	7,925
1907 .	9,325	154,592	49	40,304	4,400	103,000	6,285	24,412
1908 .	10,108	175,271	50	39,673	5,400	89,000	10,464	57,393
1909 .	13,282	201,238	60	45,056	3,900	65,283	22,352	136,599
1910 .	13,577	217,932	83	60,999	8,700	235,176	32,377	118,064
1911 .	14,357	435,622	99	73,932	12,330	267,429	17,794	86,657
1912 .	19,615	603,511	107	94,465	8,158	155,004	796	6,037
1913 .	15,129	371,528	125	113,236	7,139	173,594	2,080	21,716
1914 .	12,372	314,919	92	84,605	4,729	111,123	532	4,429
1915 .	11,615	313,081	60	48,132	12,571	270,372	46,117	207,156
1916 .	13,480	586,102	78	70,234	11,100	308,200	56,784	350,054
1917 .	16,613	744,345	63	57,251	11,800	610,200	84,779	672,539
1918 .	.	.	.	.	.	.	54,945	.
1919 .	.	.	.	.	.	.	1,656	.

**EXPORTS OF CATTLE, SHEEP AND GOATS, AND HIDES AND  
SKINS FOR THE YEARS 1907-17**

<i>Year.</i>	<i>Cattle.</i>		<i>Sheep and goats.</i>		<i>Hides and skins.</i>	<i>Total value.</i>
	<i>No.</i>	<i>Value. £E.</i>	<i>No.</i>	<i>Value. £E.</i>	<i>Value. £E.</i>	
1907	136	575	34,010	19,448	11,679	31,702
1908	361	1,591	27,089	32,112	6,253	39,955
1909	192	1,393	36,712	39,395	7,406	48,194
1910	5,646	47,491	63,919	62,947	21,539	131,977
1911	21,611	129,375	97,752	86,606	38,977	254,958
1912	15,249	107,560	110,824	110,769	43,677	262,006
1913	10,532	74,664	99,174	97,059	54,727	226,450
1914	11,390	99,868	87,569	85,975	87,507	273,359
1915	23,882	170,400	87,730	89,526	122,615	382,541
1916	15,304	104,186	74,051	74,355	110,845	289,386
1917	26,282	255,783	133,353	244,490	186,294	686,567
1918	39,205	516,920	208,805	651,257		
1919	24,904	357,936	144,626	352,703		

**DESTINATION AND QUANTITY OF UNTANNED HIDES FOR THE  
YEARS 1913-16**

<i>Destination.</i>	<i>1913. Kilos.</i>	<i>1914. Kilos.</i>	<i>1915. Kilos.</i>	<i>1916. Kilos.</i>
Egypt . . . . .	23,477	69,500	353,608	435,868
Great Britain . . . . .	60,556	163,004	66,185	222,255
India and Aden . . . . .	52,912	160,428	—	3,570
France . . . . .	120,610	188,223	8,485	5,050
Italy . . . . .	—	36,843	245,405	45,753
Eritrea . . . . .	—	58,577	440,361	31,436
Greece . . . . .	2,437	12,888	31,697	—
Austria . . . . .	112,872	69,996	—	—
Germany . . . . .	19,410	33,289	—	—
Other countries . . . . .	10,973	1,090	2,510	—
<b>Total . . . . .</b>	<b>403,247</b>	<b>793,838</b>	<b>1,148,251</b>	<b>743,932</b>

The total quantity of hides exported in 1917 was 937,000 kilos.

**DESTINATION AND QUANTITY OF UNTANNED SKINS OF SHEEP  
OR GOATS FOR THE YEARS 1913-16**

<i>Destination.</i>	<i>1913. Units.</i>	<i>1914 Units.</i>	<i>1915. Units</i>	<i>1916. Units.</i>
Egypt . . . . .	59,882	81,034	91,677	141,876
Great Britain . . . . .	122,962	200,529	100,031	174,642
France . . . . .	53,234	67,772	580	—
Italy . . . . .	—	2,733	1,720	76
Eritrea . . . . .	7,964	11,524	4,890	38,477
Austria . . . . .	16,186	6,459	—	—
Germany . . . . .	10,991	27,650	—	—
United States . . . . .	99,146	71,015	66,184	6,726
Other countries . . . . .	1,093	607	—	—
<b>Total . . . . .</b>	<b>371,458</b>	<b>469,323</b>	<b>265,082</b>	<b>361,797</b>

VALUE OF PRINCIPAL EXPORTS FOR THE YEARS 1906-13<sup>1</sup>

	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
	££.	££.	££.	££.	££.	££.	££.	££.
Bullocks and cows . . .	1,772	575	1,591	1,393	47,491	129,375	107,560	74,064
Sheep and goats . . .	1,467	19,448	32,112	39,395	62,947	86,606	110,769	97,059
Horses, donkeys, mules, and camels . . .	—	608	1,119	2,200	970	2,020	1,126	2,790
Butter and ghee . . .	8,601	3,929	9,035	8,319	6,168	8,294	10,917	10,896
Untanned skins of sheep and goats . . .	6,068	10,490	5,326	7,165	17,343	31,630	37,247	31,906
Ivory . . .	37,017	40,304	39,673	45,056	60,999	73,932	94,465	113,236
Beeswax . . .	126	1,244	314	333	1,116	3,723	2,315	338
Mother-of-pearl shell . . .	5,110	1,146	893	1,627	5,695	7,139	2,475	15,369
Dura . . .	7,925	24,412	58,211	136,599	118,064	86,657	6,039	21,716
Wheat . . .	—	5,602	492	92	1,404	7,619	1,710	—
Cotton seed . . .	3,175	7,179	8,614	9,031	10,476	31,583	15,819	21,097
Sesame . . .	3,705	19,736	25,084	63,046	65,998	71,563	89,089	104,939
Dates . . .	24,384	20,860	33,181	35,306	34,472	42,754	35,614	31,872
Ground-nuts . . .	167	2,322	1,410	3,594	8,732	13,060	10,241	9,198
Gum . . .	96,000	154,592	175,271	201,238	217,932	435,622	603,511	371,328
Senna . . .	5,710	12,276	12,483	9,309	8,965	11,073	9,625	9,647
Dom palm nuts . . .	—	—	—	—	3,987	16,156	11,161	7,982
Cotton, ginned . . .	20,675	44,002	41,451	39,283	73,171	195,272	88,549	152,110
Cotton, unginned . . .	26,574	52,007	39,211	16,969	151,529	40,574	50,636	387
Salt . . .	—	1,326	1,795	840	667	476	509	397
Gold . . .	—	—	3,212	18,495	22,832	26,719	35,408	43,802

<sup>1</sup> The figures for 1906 are approximate.

STATEMENT OF QUANTITIES AND VALUE OF PRINCIPAL EXPORTS, 1914-17.

Articles.	1914.		1915.		1916.		1917.	
	Quantity.	Value. £E.	Quantity.	Value. £E.	Quantity.	Value. £E.	Quantity.	Value. £E.
Horses, donkeys, mules, and camels	844	7,266	176	1,180	12,166	145,643	4,502	50,167
Cattle . . . . .	11,390	99,868	23,882	170,400	15,304	104,186	26,282	255,783
Sheep and goats . . . . .	87,569	85,975	87,730	89,526	74,051	74,355	133,353	244,490
Salted fish . . . . .	215,624	5,039	295,912	7,538	314,438	7,619	503,000	15,677
Butter . . . . .	76,386	5,801	203,576	16,533	129,560	12,630	132,719	16,773
Untanned hides . . . . .	793,838	49,080	1,148,251	92,315	743,932	60,743	937,000	101,999
Untanned skins . . . . .	469,323	38,427	265,982	30,300	361,797	50,102	474,000	84,295
Ivory . . . . .	92,359	84,605	60,267	48,132	78,371	70,234	62,924	57,251
Dura (and maize) . . . . .	551,849	4,429	46,117,207	207,156	56,868,400	350,054	86,201,000	672,539
Dukhn. . . . .	1,080	8	9,709,899	68,016	10,493,830	75,264	4,288,000	43,100
Sesame . . . . .	3,157,492	52,899	7,001,997	85,142	12,420,564	173,340	8,795,000	202,302
Dates . . . . .	2,342,727	29,372	2,586,384	24,167	3,697,448	43,693	3,527,000	54,277
Dom palm nuts . . . . .	2,572,747	15,282	646,710	3,776	462,076	2,476	413,000	3,419
Gum . . . . .	12,372,077	314,919	11,615,284	313,081	13,480,452	586,102	16,613,000	744,345
Sesame oil . . . . .	30,538	1,206	140,371	5,753	136,714	5,160	10,207	550
Charcoal . . . . .	189	586	3,562	13,614	5,757	29,847	5,365	42,958
Salt . . . . .	184,655	1,142	715,405	2,781	1,041,208	6,503	2,408,000	14,684
Cotton (ginned) . . . . .	1,711,698	98,555	4,304,833	236,793	2,941,163	269,093	4,174,920	504,303
Cotton (unginned) . . . . .	4,538	59	22,285	203	27,452	253	83,480	930
Cotton seeds . . . . .	3,011,953	12,509	8,243,727	33,376	8,164,636	39,106	7,671,572	45,878
Gold . . . . .	95,828	68,146	596,186	65,553	570,795	43,889	594,000	67,533
Senna leaves, pods, and mixed . . . . .	309,266	5,942	690,977	23,499	434,116	42,086	755,000	71,781

## AVERAGE VALUE OF PRINCIPAL EXPORTS, 1911-16

	£E.		£E.
Horses, donkeys, mules, and camels . . . . .	2,876	Sesame . . . . .	80,726
Bullocks and cows . . . . .	116,373	Dates . . . . .	32,756
Sheep and goats . . . . .	93,987	Ground-nuts . . . . .	8,270
Butter and ghee . . . . .	10,488	Gum . . . . .	407,732
Untanned skins . . . . .	33,902	Senna . . . . .	11,957
Ivory . . . . .	82,874	Cotton, ginned . . . . .	154,256
Beeswax . . . . .	1,333	Cotton, unginned . . . . .	18,372
Mother-of-pearl shell . . . . .	6,173	Dom palm nuts . . . . .	10,871
Dura . . . . .	65,199	Salt . . . . .	1,073
Cotton seed . . . . .	22,876	Gold . . . . .	47,937

VALUES OF EXPORTS TO PRINCIPAL COUNTRIES FOR THE  
YEARS 1915-16

<i>Countries.</i>	<i>1915.</i>	<i>1916.</i>	<i>1917.</i>
	£E.	£E.	£E.
Abyssinia . . . . .	2,923	7,497	16,239
Arabia . . . . .	132,600	152,820	47,782
Australia . . . . .	6,047	1,994	—
Congo . . . . .	110	96	196
Egypt . . . . .	653,106	1,045,250	2,589,541
Eritrea . . . . .	137,541	124,944	39,482
France . . . . .	89,936	190,723	7,650
Great Britain . . . . .	387,422	649,827	707,636
Greece . . . . .	2,349	—	—
Holland . . . . .	278	—	—
India and Aden . . . . .	6,268	12,665	18,015
Italy . . . . .	41,325	9,573	20,871
Japan . . . . .	5,143	17,668	2,624
Malta . . . . .	23,390	7,690	3,004
Spain . . . . .	1,080	—	—
U.S. America . . . . .	83,381	63,626	33,979
Other countries . . . . .	5,092	4,030	3,546

## HIDES AND SKINS

<i>Year.</i>	<i>Hides.</i>	<i>Skins.</i>
	<i>Tons.</i>	<i>Units.</i>
1913 . . . . .	403	371,458
1914 . . . . .	794	469,323
1915 . . . . .	1,148	265,982
1916 . . . . .	744	361,797
1917 . . . . .	937	302,230
1918 . . . . .	1,236	173,485
1919 . . . . .	845	448,946

## VALUE OF EXPORTS TO PRINCIPAL COUNTRIES FOR THE YEARS 1908-14

<i>Country</i>	1908.	1909.	1910.	1911.	1912.	1913.	1914.
	££.	££.	££.	££.	££.	££.	££.
Abyssinia	.	.	.	.	.	.	.
Australia	4,891	4,595	2,783	1,497	2,115	1,458	1,410
Austria	960	700	3,821	3,925	3,887	2,829	2,640
Austria	15,621	19,034	16,965	20,491	24,611	22,744	12,386
Belgium	13,483	13,386	17,341	26,908	36,809	31,619	19,148
Congo	—	—	—	118	115	146	104
Egypt	319,335	402,759	640,751	757,330	627,453	508,731	404,709
Eritrea	11,181	7,759	12,685	6,746	10,145	15,516	12,105
France	46,179	53,844	56,992	136,055	110,627	106,675	94,904
Great Britain	54,712	83,135	100,273	226,230	268,255	268,375	269,543
Germany	16,226	35,126	42,569	92,516	123,935	79,897	60,227
Greece	—	—	—	109	66	347	823
Holland	—	—	—	3,431	5,791	8,018	6,218
India and Aden	1,756	6,023	20,931	6,069	1,336	4,986	12,820
Italy	4,457	4,449	7,782	18,564	19,316	16,338	14,322
Roumania	—	—	—	—	—	—	60
Russia	—	—	—	1,919	2,120	696	634
Spain	—	—	—	8,374	4,092	6,986	1,884
Sweden	—	—	—	118	170	622	406
Turkey	—	5,994	9,529	5,712	9,567	12,177	3,901
United States	15,058	26,802	32,233	48,625	118,716	88,408	84,795
Uganda	—	—	—	—	1,226	455	179



*Re-Exports*

This branch of trade can be classified broadly as follows :

(a) Goods returned to the place from which originally brought as being no longer required for the purpose for which they were imported. This would generally cover machinery, plant, scrap iron, &c.

(b) Foreign goods which have been bought and sold in the Sudan and re-exported for trade purposes to inland frontier countries (cotton and silk goods, tobacco, sugar, &c.).

(c) Produce of inland countries bought and sold in the Sudan and eventually re-exported abroad (coffee, beeswax, &c.).

The value of the trade 1907-17 was as follows :

	£E.		£E.
1907 . . .	49,015	1913 . . .	93,655
1908 . . .	37,079	1914 . . .	87,986
1909 . . .	60,941	1915 . . .	130,315
1910 . . .	57,958	1916 . . .	227,112
1911 . . .	74,894	1917 . . .	238,616
1912 . . .	92,657		

In 1913 the re-exports of cotton fabrics amounted to £E20,820 and in 1917 to £E80,843, distributed among the purchasing countries in the following proportions :

	<i>Percentage.</i>	
	1913.	1917.
Abyssinia . . . . .	44·00	45·82
Arabia . . . . .	0·40	28·37
Austria . . . . .	0·30	—
British East Africa . . . . .	0·40	—
Congo . . . . .	16·00	3·65
Egypt . . . . .	26·20	14·30
Eritrea . . . . .	4·40	6·55
French Somaliland . . . . .	1·50	—
Great Britain . . . . .	5·00	0·05
India and Aden . . . . .	0·40	1·26
Uganda . . . . .	1·40	—

*Transit Trade*

The Sudan Customs receive no duty on transit trade, but it is a factor of importance in the economic development of the country, and has a beneficial effect on the revenues of the

railways and steamers, and affects the banking and agency business in the country.

The value has been as follows :

	<i>A. Transit (inwards).</i>	<i>B. Transit (outwards).</i>
	£E.	£E.
1907 . . .	10,281	22,242
1908 . . .	3,623	29,285
1909 . . .	6,913	23,709
1910 . . .	16,092	30,336
1911 . . .	22,723	31,002
1912 . . .	22,032	24,415
1913 . . .	34,506	34,644
1914 . . .	22,065	34,725
1915 . . .	56,267	30,008
1916 . . .	43,796	33,308
1917 . . .	36,548	33,597

The principal articles sent through the Sudan to the interior are spices, cotton thread, Maria Theresa dollars, cotton fabrics, woollen yarn, empty sacks, clothing, and ironware. The increase of £E34,202 in 1915 was principally due to an increase in the value of the import of cotton fabrics in transit for Abyssinia, about half the bulk of which is supplied by Italy, and the remainder by Great Britain and India, with a certain proportion from America.

The inward transit trade with Abyssinia increased from £E18,617 in 1914 to £E30,951 in 1915. Apparently this was the encouraging result of the reduced through rates between Port Sudan and Gambeila (by rail and steamer) which came into force in May 1915.

The principal articles sent from the interior (transit outwards) through the Sudan for shipment abroad are bees-wax, ivory, rubber, hides and skins, and feathers.

### *Channels of Trade*

The main channels through which trade enters and leaves the Sudan can be broadly classified under three headings :

Via 1. Red Sea (Port Sudan and Suakin).

2. Nile (Halfa).

3. Inland frontiers.

The value of the share of the first two routes in the external trade of the country is as follows :

	1910.	1911.	1912.	1913.
	£E.	£E.	£E.	£E.
Via Port Sudan	1,589,494	2,154,491	2,061,667	2,014,232
Via Suakin	515,067	568,608	392,683	476,698
Via Halfa	807,963	929,841	878,920	813,145
	1914.	1915.	1916.	1917.
	£E.	£E.	£E.	£E.
Via Port Sudan	1,792,600	1,631,185	2,512,492	2,749,479
Via Suakin	367,836	670,756	880,551	956,414
Via Halfa	744,780	1,101,794	1,699,829	2,946,430

Table showing the International Tonnage of Vessels visiting Port Sudan 1907-17.

Year.	British.	Foreign.	Total.
	Tons.	Tons.	Tons.
1907 .	248,833	63,937	312,770
1908 .	269,626	64,625	334,251
1909 .	293,507	90,185	383,692
1910 .	350,455	81,109	431,564
1911 .	489,499	211,611	701,110
1912 .	527,198	173,115	700,313
1913 .	527,845	194,025	721,870
1914 .	642,419	154,859	797,278
1915 .	646,266	36,659	682,925
1916 .	632,280	56,619	691,899
1917 .	370,847	58,291	429,138

Of the frontier posts—Gambeila, Gallabat (Kassala), Kurmuk (Sennar), Mongalla, and Karara (Red Sea)—the first three are the channels of Abyssinian trade, and Gambeila is by far the most important. The trade there steadily expands, and appears to have a prosperous future before it. The rubber, hides, coffee, and wax trades are capable of much more development as soon as Abyssinian affairs become more settled and security of property and vested interests guaranteed. Cheaper transport, however, is required between Gambeila and Burei.

The Bank of Abyssinia has a branch at Gambeila from March to November. The circulation of small Menelik piastres at the rate of 16 to the dollar is established at Gares and Burei.

## SUMMARY OF TRADE WITH ABYSSINIA

		CUSTOMS STATIONS.							
		<i>Total.</i>		<i>Kassala, via Gallabat.</i>		<i>Sennar, via Kurnuk.</i>		<i>Gambeila.</i>	
		1914.	1915.	1914.	1915.	1914.	1915.	1914.	1915.
		£E.	£E.	£E.	£E.	£E.	£E.	£E.	£E.
Imports	.	52,008	32,925	11,812	9,428	2,708	2,931	37,488	20,566
Exports	.	1,410	2,923	140	349	419	275	851	2,099
Re-exports	.	17,548	16,220	11,237	9,536	1,204	486	5,107	6,078
Transit (inwards)	.	18,617	30,931	—	—	—	—	18,617	30,951
Transit (outwards)	.	28,200	24,011	357	—	—	—	27,843	24,011
		117,783	107,010	23,546	19,313	4,331	3,692	89,906	83,705

		<i>Total.</i>		<i>Kassala, via Gallabat.</i>		<i>Sennar, via Kurnuk.</i>		<i>Gambeila.</i>	
		1916.	1917.	1916.	1917.	1916.	1917.	1916.	1917.
		£E.	£E.	£E.	£E.	£E.	£E.	£E.	£E.
Imports	.	76,250	114,659	16,888	30,589	3,192	6,418	56,170	77,652
Exports	.	7,497	16,239	785	1,422	405	445	6,307	14,372
Re-exports	.	19,504	43,198	9,800	21,725	111	132	9,593	21,341
Transit (inwards)	.	10,601	5,789	—	1,080	—	4,709	10,601	—
Transit (outwards)	.	21,155	18,265	—	—	—	—	21,155	18,265
		135,007	198,150	27,473	54,816	3,708	11,704	103,826	131,630

Trade on the Kassala-Sennar frontiers does not show signs of any great development, and is more or less confined to the bartering of local commodities for cotton and silk goods. When the railway offers quicker and cheaper transport commercial enterprise will no doubt come forward, and the conducting of business on more up-to-date lines (as at Gambeila) may give an impetus to trade.

Khartoum serves as a clearing-house for transit cargo passing inwards and outwards through the Sudan, as an assessing station for the royalties on gum, ivory, &c., and duty on parcel post. To assist merchants who are indisposed to leave money at frontier places, goods are permitted to be shipped from up country under guarantee, subject to the payment of duty at Khartoum on arrival of the goods.

#### LABOUR AND INDUSTRIES

The first condition of realizing the projects of cultivation and irrigation and improved means of communication is a much more abundant supply of labour and one more active, intelligent, and reliable than at present exists.

The labour problems of the Sudan have arisen largely in connexion with the transition from a society based on slave labour to one based on free labour. The difficulties inherent in this economic revolution have been greatly aggravated owing to the loss of man power during the rule of the Khalifa, when more than half the population perished either by the sword or from pestilence and famine. The cheapness of land and the ease with which a livelihood can be obtained from the soil are also important factors in the situation. No regular wage-earning work had been known in the Sudan previous to the present administration, labour and slavery having been synonymous. The abolition of domestic slavery, which could not be precipitately enforced, is an accelerating process, the attitude of the government towards what of it yet remains being still that expressed in Lord Kitchener's 'Memorandum

of Instructions to Mudirs, 1899': 'Slavery is not recognized in the Sudan, but as long as service is willingly rendered by servants to masters, it is unnecessary to interfere in the conditions existing between them. Where, however, any individual is subjected to cruel treatment and his or her liberty interfered with, the accused can be tried on such charges, which are offences against the law, and in serious cases of cruelty, the severest sentences should be imposed.' The slave can always claim freedom as a right without any compensation to the master, the magistrate being bound to register him as a free man when he makes the claim. As a result the readiness to buy slaves, should a surreptitious opportunity occur, is checked, and those who voluntarily remain in a state of servitude are well treated.

The consequences of emancipation are not always immediately good either for the individual freed or for the agricultural interests of the country. The magistrate who registers the freedom of a slave generally tries to persuade him to return to his master as a paid servant. Where he fails the ex-slave tends to drift into vagrancy and may then be liable to compulsory labour on public works or on a firewood station. Others enlist in the army, where they make excellent soldiers, but are lost as cultivators. As regards the Arabs, much cultivation is carried on by the riverain population in the northern Sudan, but generally speaking they are disinclined to manual labour, the nomad Arab being almost entirely averse. Among the Arabs are many landholders, formerly wealthy from the labours of from 20 to 200 slaves, and these, although their position has improved since the first hardships produced by the measures of emancipation, are still much handicapped by shortage of labour. They continue to manifest their unwillingness to cultivate with their own hands, but they make their children work. In the 1907 report on Berber province it is stated that, 'boys do as much or more in the day than men.' As in all oriental countries children begin to work very young. At four or five years old a boy starts

driving an ox, working on a water-wheel, or scaring birds. When such boys reach manhood they are more likely to copy the example of their fathers than to continue in the habit of work thus early required ; but it is obviously most important that the Arabs should break with their traditional disinclination to labour with their own hands.

With a population so greatly reduced in numbers and largely disinclined to hard work the question of the supply of labour has at times been very acute, and in parts of the country cultivators can still obtain labour only at a very high cost, particularly when the area under crop is above the average. A good rainfall allowing of the production of crops with exceptional ease always attracts labour from the more arduous cultivation by *sakia*. For some time after the reconquest of the Sudan the demand for labourers on public works and some important private enterprises made a heavy call on the small supplies available.

Although it remains true that production in the Sudan is still greatly handicapped by scarcity of labour, and is likely to be hampered in this respect for some time to come, it is possible to take a much more hopeful view of the situation than seemed justified a few years ago.

Statistics of trade are instructive on this point. Even if allowance be made for inflation of values during war-time, the fact that the value of trade increased from £2,000,000 to nearly £7,000,000 in the course of ten years indicates that a good deal of the proverbial slothfulness of the people is largely to be attributed to lack of opportunity, and that given adequate supervision, fair means of production, and a market for their crops, they will take advantage of opportunities when they occur. For instance, the war has brought a demand for *dura*, and good rains have enabled it to be grown, with the result that the export for 1915-16-17 amounted to upwards of 200,000 tons, as compared with only 3,500 tons in the preceding three years.

In the Gezira, at Tokar, and north of Khartoum, the native has shown himself adaptable to greatly improved methods of

cotton cultivation, and takes up with avidity wheat-growing on land brought under pump irrigation.

Leaving out of account the demoralizing effect of centuries of misgovernment and insecurity of property, the uncertainty of a variable rainfall and a fluctuating river is sufficient in itself to produce a slipshod and fatalistic state of mind in the cultivator, who in any year may lose the fruit of his toil from circumstances over which he has no control.

The Arab cultivators are, indeed, in many ways alert and receptive, but he needs ocular demonstration and sympathetic handling to induce him to make departures from his conservative methods. He is certainly by no means at the bottom of the oriental scale of efficiency. It has to be remembered that he is not physically capable of heavy manual labour and cannot compare with the Egyptian fellah in physique.

Even the nomad Arab occasionally succumbs to the influence of progressive ideas, and in Kordofan has learnt from the Veterinary Department how to inoculate his cattle against disease.

There is no doubt that improvement of transport facilities combined with the liking which the Arab has for travelling about and seeing the world will have an increasingly good effect in waking up the people to more enterprising habits.

The black, i.e. Sudanese, cultivators are on a lower plane of intelligence, but of these the country contains so many distinct types of such varying characteristics that it is impossible to generalize as regards their industrial capacities. There is a wide gulf, for instance, between the relatively industrious Nubawi and the primitive cattle-owning Dinka of the Upper Nile. The southern districts of the Sudan contain much promising labour, but these areas are so remote and destitute of trading facilities that the people have little or no incentive to grow more than is sufficient to provide themselves with food. Until transport is developed the inhabitants of these districts must remain a negligible factor in the labour problem.

In point of numbers the situation is also gradually changing



for the better. There has undoubtedly been a very large increase in the population since the reconquest of the country. It is impossible to give a reliable estimate of this increase, but most reports draw attention to the number of children to be seen in the villages, and the number of survivals amongst children must now be far greater than in Dervish times. There has also been a large influx into the Sudan of people from neighbouring states, especially of Fellata and other inhabitants of central and western Africa. The re-opening of Darfur will no doubt lead to a further influx from those directions, especially as the pilgrimage to Mecca by this route will now be much easier. There is very little immigration from Egypt, as the fellah will rarely leave his village if he can help it, and the Nubian prefers Lower Egypt to the Sudan. Gangs of labourers from Upper Egypt have been obtained from time to time on short contracts by the Railway and Irrigation Departments.

It should be added also that more recent investigations show that in parts of the Sudan the population is greater than was supposed. For instance, fairly reliable estimates made in 1913 put the sedentary population north of the railway in the Gezira at some 255,000 people. If to these be added the number of the sedentary population in adjoining districts, the total of people who will be more or less directly affected by the Gezira irrigation scheme is upwards of 600,000. The comparative density of the population in these parts is a factor of great importance both as regards the carrying out of this large irrigation scheme and the successful working of the scheme when completed.

The construction of the works will no doubt put a severe strain on the labour market, especially in the early stages, but will serve a useful purpose in accustoming the people to steady work and showing them the benefits of regular employment and an assured income. Cultivation on the land commanded by the works should show the beneficial result of this preliminary training, and the population should be quite sufficient to take up the land at the rate at which it will be

gradually developed. There is no doubt that the provision of a regular supply of water for irrigation over this large area will stabilize labour conditions and anchor a large population permanently to the land in this area. Migrations in times of drought will largely cease.

At the ports Arabs from the Yemen are employed as porters and are excellent manual labourers, but show little or no inclination to settle permanently in the Sudan.

The question of the introduction of Indian and other alien coolie labour has been mooted from time to time, but there are obvious objections to such importations into a newly settled country such as the Sudan.

Before the war the average rate of wages for unskilled labour in the northern and central parts of the Sudan was, approximately, men P.T.  $3\frac{1}{2}$ , women P.T. 2, boys P.T. 1 per diem, but these rates fluctuate a great deal according to the time of the year and the nature of the harvest. In 1913 and 1914, for instance, during the drought, when labour was plentiful, it could be got in Blue Nile for as little as P.T. 1 per diem and even less. During the rains, on the other hand, it rose to P.T. 6, and in years of good rainfall reaches P.T. 10–P.T. 15. The period January to April is the cheapest time in the labour market.

During the war wages had risen owing to the rise in the cost of living, and the average rate for a man became P.T. 5 or P.T. 6 a day.

In some localities, particularly in Tokar, during the cotton season, when the period of harvest is strictly limited by climatic conditions, wages are very high, running to P.T. 15–P.T. 20 a day when the crop is a large one.

Skilled labour, most of which is imported, though the native supply is increasing, varies roughly from P.T. 10 to P.T. 20 a day.

Reports in 1919 stated that labour in the Sudan was getting scarce, and wages correspondingly increasing. According to a report from the Blue Nile Province, wages reached as much as P.T. 45 per day.

It has to be remembered that in the Sudan, as in other Mohammedan countries, the wage earner has numerous dependants for whom to provide. This accounts to some extent for the fact that a man whose own expenses only amount to P.T. 30 or P.T. 40 a month obtains a wage of P.T. 100 or more. The surplus of pay over expenses is also less than would appear, as the Sudanese is not inclined to work steadily day after day but takes considerable intervals of leisure.

Wages are, nevertheless, high and are likely to remain so until the supply of labour increases and the struggle for existence becomes more acute.

Labour questions are dealt with by the Labour Bureau and certain measures of constraint, or at least of control, have been enacted. An ordinance of 1905 (No. 1) punishes vagabondage, and refers among others to those who neglect or refuse without justification to provide for their needs or those of their family. The Labour Bureau instituted at Khartoum in 1906 prepares statistics, finds outlets for labour, prevents competition among the various departments of the public administration and contractors or proprietors from causing any exaggerated rise in wages. An ordinance of June 9, 1908 regulated the conditions and durations of apprenticeship, fixing the duration at five years, and laying down the procedure in differences between masters and apprentices. The labourers are registered, among other objects, to distinguish parasites from real workers. The technical schools and state workshops are helping to produce a generation of Sudanese equipped with a trade.

The casual labour market is made up of (1) Arabs who visit the towns for short periods to earn some money and then return to their villages. A percentage of them, mostly Baqqara from the west, are regular labourers who remain in the town. They are for the most part good agriculturists, and do light spade work, but are averse from heavy manual labour; (2) Sudanese, included under which loose term are Shilluk, Dinka, Nuba, Zaghawa, &c., who form a more sedentary population, moving about occasionally in search

of work. Most of them are ex-slaves, adapting themselves to urban existence, and showing no strong inclination to return to their own districts. They are the unskilled workmen of the Sudan, and, when they can be induced to labour, excellent labourers; (3) Fellata (West Africans), a most useful population which increases steadily. In Omdurman, where they form a prosperous colony, they are fast obtaining a monopoly of domestic work, water-carrying, &c. They are thrifty and hard-working, and willing to accept small wages. Though not expert agriculturists or capable of heavy manual work, they are willing to learn and are said to be excellent cotton-pickers.

In 1910 it appeared that the country could in normal circumstances supply the amount of casual labour required by the government departments without unduly draining the agricultural population. In 1912, 10,500 labourers were registered, 44 per cent. of them at the Central Bureau, Khartoum. The supply of labour was easily adjusted to the demand owing to the high price of grain and the absence of any enterprise involving the employment of a large number of labourers. The quality of the labour was still considered poor, and, while during the winter months the supply of labourers was slightly in excess of the demand, in summer a sudden demand for several hundred men was still sufficient to upset the local labour markets. In 1913 there was a supply of labour in excess of the demand as regards quantity. The number of labourers in government employ was 8,230 in February, and only 5,500 in June, when the bulk of the population was cultivating. Owing to a shortage of labourers for hoeing and weeding the daily wage at the Tokar cotton fields rose to P.T. 13 in September, but the dispatch of 270 labourers from Khartoum brought the rate down to P.T. 6 per diem. The supply of unskilled labour during 1914 was fully equal to the demand. The demand for the supply of skilled labourers exceeded that of previous years, particularly in the case of private companies.

In 1914 the total of Sudanese casual labourers registered

throughout the country was 11,443, and of Mugadamin (gangmen) 515. The average wage for casual labourers was  $3\frac{1}{2}$  to 4 piastres per diem.

Native industries, apart from agriculture and stock-keeping, are relatively of little importance. Homespun cotton cloth, 'damur', is made in considerable quantities, in Berber, Dongola, Kordofan, and Darfur, but is being supplanted by machine-made substitutes from Lancashire.

Tanning is carried on in native fashion, on a fairly large scale near Omdurman. The Railways Department has carried out satisfactory tanning experiments. It is hoped that the existence of the necessary raw material in the Sudan will bring capital into the industry. Native shoes are made at Omdurman and also at Wad Medani.

Good leather work is done at various places in the northern Sudan.

Sakia making and boat-building are old industries north of Khartoum, the workmanship though rough being very effective.

Oil pressing, for local domestic requirements, is carried on in many villages in the central and southern Sudan, by means of a primitive wooden press worked by camel or ox.

Basket and mat weaving is fairly widespread. In Berber and Dongola provinces, especially, very large numbers of baskets for earth-carrying in excavation works are made annually from dom palm leaves, and at El-Damer in Berber province there is a factory (under European management) for making buttons out of the kernels of dom-nuts—vegetable ivory. The natives of Bahr el-Ghazal are expert mat weavers.

A little soap is made at Khartoum and Suifa. At Omdurman, Khartoum, and a few other centres are a number of dura-mills. For some little time past nearly all flour, whether wheat or dura, used in the Sudan has been milled in the country owing to the cessation of imports of flour during the war.

Salt washing is done in various localities in the northern Sudan; 5,000 or 6,000 tons of salt are got annually from

the saline deposits at Ras Raweiya north of Port Sudan, this now being the chief source of supply for the Sudan.

Iron is smelted in rough native fashion in Bahr el-Ghazal province and other places in the south.

Travelling tin-smiths, a somewhat despised form of employment, perambulate the country.

Gold washing is carried on in the Beni Shangul country, though on a very small scale.

On the Red Sea coast there is a fish-curing industry, and considerable quantities of fish are exported to Egypt where it is mostly eaten by Copts.

After the outbreak of war there was a large increase in charcoal burning. Several thousand tons are now exported annually to Egypt.

Native butter, ghee, is made in Kassala, which exports to Arabia, via Suakin, and also in the western Sudan.

Cheese is made in Khartoum and elsewhere, but in trifling quantities.

Pottery, tiles, and water pipes of an improved type are now turned out on a considerable scale at Omdurman, where the government technical school has brought about a great improvement in the industry. The potter's wheel, comparatively an innovation at Omdurman, is now much more used.

Pearl shell fishing is carried on along the Red Sea coast, but not so extensively as in times gone by.

Rope making, for local requirements, is carried on all over the country. In the south the natives make extensive use of the numerous fibres which occur for ropes, hunting nets, &c.

It should be mentioned that transport, viz. native boat traffic and carriage of goods by camel, is a very important native industry, many thousands of tons of goods and merchandise being transported, usually to and from river and railway stations.

European enterprise is confined to farming and the import and export business, and there are no European manufacturing industries that call for special mention.

## CHAPTER XI

### HEALTH CONDITIONS IN THE SUDAN : WATER SUPPLY

General conditions of health—Conditions affecting the health of Europeans ; some precautions—Measures taken by Government to improve health conditions—Prevalent diseases—Diseases of animals—Insects and other pests—Water-supply.

#### GENERAL CONDITIONS OF HEALTH

HEALTH conditions in the Sudan naturally vary with the varied character of the districts and with the time of year. In the northern zone the winter climate, from the beginning of November to the middle of March, is excellent ; the air is dry and invigorating, and the nights are cool. The strong sun acts as a disinfectant. The summer, however, is very trying, especially to the nervous system, which suffers from the great heat and the electrified state of the atmosphere. Sand-storms (*habubs*) cause much worry and annoyance ; they prevail in Khartoum and other places surrounded by desert between May and July. In spite of these drawbacks, Khartoum has been transformed from a notorious disease-centre into one of the cities with the lowest death-rate in the world. For the year ending September 30, 1912, it was but little over 9 per thousand, and there were only 6 cases of typhoid out of a population of 50,000. The recorded death-rate for the year ending September 30, 1917, when health conditions were adversely affected by an abnormally high Nile and imported malarial infection, was still only 12·8 per thousand.

Dongola and Kordofan Provinces may, on the whole, be considered healthy most of the year, and conditions throughout the transitional zone are fairly favourable, except after

the rains. But in the southern or tropical zone, the vast swamps, where millions of *Anophelines* breed, and the forest regions of the south-east, where the soil is extremely damp after floods, have been conspicuously unhealthy, and must still be so considered, in spite of all improvements and precautions.

A good standard of general health, however, prevails among the adult natives throughout the drier parts of the country; they are remarkably prolific, but ignorance and overcrowding in insanitary houses have resulted in an excessive infant mortality; statistics as to this last are not reliable enough to quote. The same causes have, in the towns, fostered their natural susceptibility to chest troubles, as climatic conditions have done among negroes and others in the south. Tubercular glands in children and other forms of tuberculosis (Arabic, *sil*, *daran*) are common, also pneumonia, which often proves fatal. Lying out at night in clothes soaked with perspiration is considered a frequent predisposing factor.

Malaria (Arabic, *humma*), to which natives are equally liable with Europeans, is perhaps the chief curse of the country. It was estimated in the past to constitute 80 per cent. of the total of disease in the Bahr el-Ghazal Province, though recent measures have now much reduced the percentage. All three forms of the malaria parasite occur. Only one species of *Anopheline* is identified in the northern Sudan, viz. *Anopheline costalis*, but that unfortunately is one of the worst malaria vectors known.

Dysentery is common, especially in the amoebic form, though the bacillary is more frequently found on the Red Sea coast, and caused a severe outbreak in the Bahr el-Ghazal in March 1914. Many districts suffered from an amoebic outbreak in the following year; most of the cases occurred in September, after the rains. Undetected human 'carriers' and flies have proved a greater danger than infected water.

There are several kinds of fevers, e. g. dengue (see p. 505), undulant or Malta fever (see p. 507), and a seven-day fever, the causative organism of which has not been discovered,



but which is almost certainly a form of dengue, transmitted by the mosquito *Stegomyia fasciata*. It appeared among the troops on the western frontier in June 1917. There are several fevers resembling enteric; the latter seems usually to be introduced by Egyptians or Europeans, and is rare among the natives. Of 26 cases (including paratyphoid A and B) in the Khartoum and Omdurman hospitals in 1917, 14 came from Egypt. Typhus is very rare, though there are occasional visitations, as in Halfa Province in April-May 1914. Relapsing fever (spirillary fever) is extremely rare, and is due to importation from Egypt. Its distinctive micro-organism *Spirochaeta berbera* is probably conveyed by the body-louse. The tick *Ornithodoros moubata*, which conveys it in southern Africa, has not been identified in the Sudan, though certain closely allied ticks have been.

Diphtheria seldom assumes an epidemic form, and is mostly found among children. Cerebro-spinal meningitis is endemic (see p. 505), and caused an epidemic in many districts in 1915. It often results in high mortality. In the Omdurman outbreak of 1914 there were 33 cases, of which only one recovered. Smallpox (Arabic, *gidri*) broke out round the Akobo Post in the first half of 1914 and, to a small extent, in Khartoum in 1917. It is usually present, though much checked by Government vaccinations; it formerly ravaged the Anuak and other tribes. Epidemics of measles, mumps, and chicken-pox are fairly frequent; these mild complaints may assume a more serious character among the southern negroes; the chicken-pox is frequently a disease of adults and of a more virulent type than in England. Cholera (Arabic, *shota*) is endemic in Egypt, and has occasionally shown itself in the Sudan, as, for example, among the troops in the Atbara campaign, at Omdurman in 1913, and in Mongalla Province at the beginning of 1918. Strict supervision is exercised over pilgrims, and quarantine established when necessary. Plague (Arabic, *taun*) is very rare, but has also shown itself occasionally, e. g. simultaneously with the cholera outbreak in Mongalla Province mentioned above, but there has been no actual epidemic. Pilgrims to

and from the Hejaz are closely inspected, and quarantine measures promptly taken when necessary. Systematic destruction of rats (the infection being conveyed by rat-fleas) and the use of Haffkine's protective vaccine are essential should plague appear in any area. Leprosy (Arabic, *goyam*) is rare, it occurs in sporadic cases all over the country. The natives have not been in the habit of regarding it as contagious. A leper segregation colony has been started at Omdurman by Government.

Diseases due to body vermin or internal parasites are very common, e. g. bilharziasis (see p. 504), especially from infection from Egyptians and, in the south, guinea-worm (see p. 505). Eye-troubles, e. g. trachoma, are far less frequent than in Egypt, though a mild form of conjunctivitis prevails. Trachoma has been reported in the Sobat-Pibor district and among the Shilluk of the Upper Nile. Two forms of Leishmaniasis, e. g. kala-azar and Oriental sore, are found (see pp. 506-7), and various skin-diseases, including yaws (see p. 510). Syphilis (Arabic, *zhurri*, *halug*) and gonorrhoea (Arabic, *bagal*) are widespread and, unhappily, on the increase, especially among the southern negroes, where venereal disease had been practically unknown before the trading and Government posts were set up. Kordofan, the trading Arabs generally, and the Egyptian troops are much infected. The type of syphilis found is sometimes a very virulent one. Arab native doctors prescribe various quack treatments. There were in all 961 cases of venereal disease in the hospitals of Khartoum, Khartoum North, and Omdurman in the year ending September 30, 1917; taking the lowest estimate it would appear that about 3,000 persons must be infected in those localities each year.

The dreaded sleeping-sickness (see below, p. 508) has invaded the southern Bahr el-Ghazal and Mongalla Province, at present in well-defined areas only; rigorous precautionary measures have been instituted against its spread.

Two maladies that have recently affected the troops must be mentioned. One was an outbreak closely resembling beri-

beri, reported for the first time in the Sudan in 1914, near Khartoum; it was checked by improved vegetable rations, and has not since recurred. The other is a peculiar form of sore throat, caused by a spore-forming organism, and resulting in heart trouble.

#### CONDITIONS AFFECTING THE HEALTH OF EUROPEANS; SOME PRECAUTIONS

The following is a list of miscellaneous headings, arranged alphabetically, dealing with conditions of life in the Sudan as they affect the health of Europeans.

*Bathing.*—Bathing in rivers or pools is often risky as, beside crocodiles, the water may harbour bilharziasis or guinea-worm.

*Biting and Stinging Pests.*—Care should be taken to avoid as much as possible being bitten by the host of crawling and flying pests that make life a torment in many parts of the Sudan—mosquitoes, sand-flies, tsetse-fly, serut-flies, and others. These will be treated more fully under the diseases that they convey. Native huts abound in vermin (lice, bugs, and ticks), the agency of which in carrying infection is being increasingly recognized; these huts should be given a wide berth when possible.

*Chills.*—In view of the great variation (at least 30 degrees) in day and night temperature in the Sudan (see *Climate*), care must be taken to avoid chills. It is advisable to bathe and change clothes before sunset. When camping out in the desert it is often very cold at night, and a cap and flannel belt or roller should be worn in bed. According to a leading authority it is not desirable to wear a cholera belt in the day time, though it should always be worn at night.

*Constipation and Diarrhoea.*—These are both conditions which may assume more serious proportions in the Sudan than in England, and which should be carefully guarded against; the former is often induced by camel-riding.

*Drinks.*—(1) *Drinking-water.* In view of the fact that many

diseases, e. g. typhoid, guinea-worm, bilharziasis, are water-borne, it is highly important that all water should be boiled for five or more minutes, except in Khartoum, where, as has been already said, a pure supply is now ensured. Five minutes' actual boiling suffices to destroy the elements of danger. Sterilizing tablets may be employed in travelling, or a Doulton or Pasteur filter. These filters, however, are quickly clogged by the fine, furry deposit from the water. Water from deep wells is usually preferable to that from a river; if the water is aperient, milk should be mixed with it. Cups and bottles should themselves be cleaned with boiling water, and native servants, who are often infected in various ways, should not be allowed to use them. Water-tanks carried by camels should always be locked.

(2) *Alcohol*. Alcohol is best avoided, except under medical advice, and should then be taken after sundown only. It should never be taken between meals. Brandy should be carried in case of collapse, snake-bite, or other emergency.

(3) *Milk*. Great caution should be used in seeing that milk vessels are clean; the negroes usually wash theirs in cows' urine. If goats' milk is drunk it is wise to boil it thoroughly, as Malta fever may be conveyed by drinking milk from, or contaminated by, infected goats. Tinned milk or milk powders are useful for travellers in the interior of the country.

*Food*.—No uncooked food, e. g. salad, should be eaten, as it may contain the germs of disease. An exception may be made in the case of fruits that can be peeled or thoroughly washed. To eat previously cooked food cold is risky, as it may have become contaminated since cooking. All food, cooked or uncooked, must be protected from flies and ants. Moderation in eating should be specially observed in hot climates.

*Houses*.—Dwellings should be built on the usual tropical lines, e. g. with deep, ventilated verandahs, allowing of the escape of heated air, roofs that do not let the sun penetrate, and walls coloured green or brown, not white, which is too glaring. They should be at a distance from stagnant water,

and from native huts, and should be able to resist sand-storms. Doors and window frames should be covered with mosquito-proof wire netting.

*Malaria*.—The most important measure is to avoid, if possible, being bitten by mosquitoes ; the second is to take quinine.

(1) *Mosquito Curtains*. These should be invariably carried and used ; a spare curtain in reserve should be taken. When holes occur they should at once be carefully tied round with string. The curtain should be stretched tight, and thoroughly tucked in round the bed, and the body should not rest against it. White net is better than green, as it shows up the mosquitoes. The mesh should be not less than sixteen holes to the linear inch, and there should be a strip of calico one foot deep round the edge, above the bed level, to prevent the arms being bitten through the net. This calico strip should be continued downwards to serve as the tucking-in part. Long boots, reaching to the top of the thigh, are a good protection ; trousers and putties should be worn rather than shorts. The wearing of two pairs of socks effectually prevents mosquitoes biting round the ankles.

(2) *Quinine* should always be carried. Opinions differ as to the methods of taking it, but the following rules are prescribed by a leading authority. In any fever area 6 grains should be taken as a precaution every evening, or up to as many as 10 ; after being attacked by fever 30 grains a day should be taken for three weeks, the first ten days of which should, if possible, be spent in bed in order to prevent relapse ; after this 15 grains should be continued daily for a period of three months. The tablets should be crushed, to make sure that the quinine is soluble. The diet, when attacked, should be milk, with eggs, soup, or beef tea, and 3 grains of calomel should be taken at night, followed next morning by a tablespoonful of Epsom salts dissolved in half a tumbler of hot water.

(3) *Choice of Camp*. A camp or dwelling-place should be, if possible, on high ground and at some distance from

standing water, the river, or a native village. For precautions as to standing water, wells, pools, and indoor receptacles, where mosquitoes readily breed, see below, p. 497. Tins and bottles should not be left about. Bathing should be stopped at sundown.

(In the southern Sudan ground infected by jiggers (see below, p. 515) should be avoided. If their presence is suspected the ground should be fired, or treated with a strong infusion of native tobacco.)

As it is often impossible to distinguish malaria by the symptoms only from fevers due to other causes, it is important to know how to make a smear of blood on glass suitable for microscopic examination; this should be done before the quinine dose is taken.

Prolonged exposure to malarial infection or carelessness after malarial attacks sometimes leads to blackwater fever (see below, p. 504).

*Sand-storms.*—See p. 488.

*Snake-bite.*—See below, p. 516.

*Sunstroke and Heatstroke.*—In the northern Sudan, owing to the dryness of the air, heatstroke is rare. Sunstroke is not uncommon, especially during September, and in the case of careless newcomers. It occurs most frequently along the Red Sea littoral. Every precaution should be taken against the intense power of the sun in the Sudan. The head, neck, and spine should be well protected. Cork or pith helmets should be worn, never a straw hat before 5 p.m., and the head should never be uncovered out-of-doors till at least an hour later. Coloured glasses save the eyes from glare. The extreme heat of the sun or surrounding air may be aggravated by such conditions as muscular fatigue, drink, insufficient ventilation or supply of drinking-water, unsuitable clothing, or the checking of perspiration. Giddiness and severe headache are symptoms, sometimes accompanied in serious cases by a high temperature or convulsions. In the milder cases rest in the shade or a cool room, with cold applications to the head, and light diet will be sufficient; calomel, followed by

salines, should be administered later. There is an asphyxial form of heatstroke in which artificial respiration is required ; lumbar puncture is now being employed with good results.

*Vaccination.*—Europeans should invariably be vaccinated before coming to the Sudan, and inoculated against typhoid and paratyphoid A and B ; a combined inoculation has recently been discovered which avails against all three.

#### MEASURES TAKEN BY GOVERNMENT TO IMPROVE THE GENERAL CONDITIONS OF HEALTH IN THE SUDAN

Scientific study of general conditions affecting health is carried on at the Wellcome Tropical Research Laboratories, Gordon College, Khartoum. Information and specimens are collected from the whole country and commissions for investigation and experiments sent out. A Central Sanitary Board has been set up to regulate health conditions in the Sudan, each Province forming a sanitary district, usually with a local sanitary board and inspectors. The measures adopted include the following : anti-mosquito campaign, improvement of sanitation and supply of drinking-water, treatment of infectious diseases, and maintenance of hospitals and dispensaries.

#### *Anti-mosquito Campaign*

The anti-mosquito campaign is far-reaching, and of vital importance for the suppression of malaria. ' Mosquito brigades ' have been at work since 1904, directed as a rule by qualified British inspectors with Sudanese foremen ; they have head-quarters in many of the provincial towns, and in Khartoum itself have proved extraordinarily vigilant and effective. Their incessant labours have now practically resulted in the extermination of the mosquito there, so that the malarial outbreak of 1917-18 was greeted with general surprise and annoyance. A quarantine station at Khartoum has been established for the examination of boats and steamers. These are thoroughly cleansed, and any bilge-water tanks or other receptacles treated with oil.

When the mosquitoes on board are inaccessible owing to overlying cargo, they can be 'bolted' by non-poisonous smoke from a special machine, but at present there is only one such machine. It has been suggested that the problem might be solved by building boat-houses, which could be closed, and in which fumigation with hydrocyanic gas could be carried out, combined with water-spraying to 'sprawl' the stupefied mosquitoes. Two sanitary policemen patrol the river-banks and inspect the boats tied up there. A petrol launch for anti-malarial work has lately been acquired. Town wells and pools, and irrigated areas outside, are systematically inspected. Unused wells are a source of great danger, and are blocked up when possible. All wells are ordered to be kept covered, and the digging of new ones by private owners in the town is discouraged. Cisterns, water-butts, and buckets must also be kept covered, and litter which catches rainwater, such as empty tins, cleared away. Pools are drained, or treated with oil or other larvicides, such as sanitas-okol or ialene; paraffin and petroleum are also much used. Another larvicide consists of a mixture of carbolic acid, resin, and caustic soda. An interesting experiment has been made in introducing certain fish, which will eat mosquito larvae, and can live in stagnant water, into tanks and irrigation channels. The fish are *Ophiocephalus obscurus*, *Cyprinodon dispar* (from the Khor Arbat), and *Heplochilus marni* (from Lake No); the success of the experiment is not yet absolutely proved.

With regard to irrigated areas it is recommended that a dry, bare stretch of land, at least one mile wide, should be left between them and towns. The chief source of danger is from the stagnant water in the *gudwals*, or channels, when these are not in use, especially at their 'blind ends'. If these are treated weekly with larvicide no mosquito can breed out. 'Weeping' channels, i.e. those where the water dissolves out the soil on the banks, are a great source of nuisance. Recommendations as to these irrigation channels have been issued, as follows :



Irrigation channels should be constructed on a higher level than the surrounding land, so that when the flow of water in them ceases they may drain dry. They should be so constructed (e.g. with sluices) as to prevent leakage, and should be kept in good repair to prevent the formation of pools; 'blind ends' should be as much reduced as possible. Vegetation should be periodically cleared out and, where possible, fish introduced, to destroy the larvae. Crops requiring to stand in water should not be grown within half a mile of any town or village. Any cases of malaria or prevalence of mosquitoes should be notified.

Special care has to be taken in the supervision of native-owned areas or estates. Government farms, e.g. at Shambat and Khartoum North, have shown that it is quite possible to have an irrigated area so managed as not to increase malaria risks.

In the Khartoum district fines are imposed for neglect of small receptacles (such as barrels, vases, jugs, and the shallow dishes of water in which furniture legs stand to keep off ants) should larvae be found in them, or mosquitoes allowed to breed out. Oiled rags should be wrapped round the furniture legs instead of using water. Water jars (*zeers*) are by order to stand above the ground, not half sunk in it, and to be kept covered.

Forty-four different species of mosquito, belonging to several genera, notably *Culex* and *Anopheles*, have been identified in the Sudan; among those found in Khartoum are *Stegomyia fasciata* or *S. calopus*, found chiefly on boats or steamers and in *zeers*, *Culex fatigans*, breeding chiefly in wells, and, more rarely, the Anopheline *Pyretophorus costalis*. Of these *Culex fatigans* is the most persistent; it very closely resembles the common English gnat (*Culex pipiens*), and its larvae can breed in sewage and contaminated water.

The *Anopheles* may as a rule be recognized by three characteristics: (1) its straight shape, whereas other genera are bent or hump-backed; (2) its position when resting—at an angle

from the surface ; (3) its spotted wings. It does not usually fly far from its breeding-places, which are mostly standing pools ; it prefers those with clay bottoms to those with sandy beds. It is silent, and bites chiefly at evening or night, when the victim is quiet. The larvae of the *Anopheles* may be distinguished from those of the *Culex* ; the former have been described as ' darters ', the latter as ' wrigglers '. The provision of artificial breeding-places for mosquitoes driven out of the boats and steamers is one feature of the quarantine system.

The recent malarial outbreak in Khartoum, to which allusion has already been made, was partly due to the highest Nile known since the reoccupation of the country, partly to the coming in of an infected native boat which had evaded quarantine. Owing to coal shortage during the war the amount of wood brought in by boat has been greatly increased, and the *Anophelines* harbour in this wood and then fly ashore. *Stegomyia* was also found breeding in the town for the first time in several years. There were in consequence over 700 malarial cases (including blackwater fever) in the hospitals, of which 547 were imported into the town. Of the remainder 107 occurred in November, December, and January.

#### *Improvement of Sanitation and Supply of Drinking-Water*

These ends have now been obtained in Khartoum and are receiving attention in the smaller towns and up-country stations. The proper removal and destruction of sewage is an important feature.

The sanitary inspectors in Khartoum have already done invaluable work for the health of the city. They make house-to-house visitations, and see that the public latrines, markets, and slaughter-houses are kept clean. The satisfactory removal of sewage was a great problem, which has now been overcome. It is collected and removed in galvanized iron buckets with air-tight lids carried on carts drawn by camels, and is carried to a distance from the town by a conservancy tramway ; it is then disposed of in trenches

and at the sewage farm. Destructors and incinerators are also employed. Waste water is removed by irrigation channels or percolation pits. No pains have been spared in perfecting the type of the public latrines, and strict regulations have been enacted with regard to private ones, which, in new houses, must not form part of the dwelling-house. In other respects, too, new houses must conform to an established standard, which varies for the first, second, and third class quarters of the town. Similar rules will be enforced in towns that are being rebuilt, e. g. El-Obeid.

Efforts have also been made to diminish overcrowding, a great number of the natives having been removed to villages outside the city.

There is systematic inspection of mineral-water factories, ice factories, and bakeries, and the veterinary department runs an excellent dairy, which affords the main supply of milk for Europeans. Measures to ensure greater cleanliness and purity in the supply from other quarters should speedily follow.

For the present pure water-supply in Khartoum see under Khartoum, in the *Gazetteer of Towns*. The chief features are very deep wells, the upper strata of which are cut off laterally by a cement casing, and underground distributing pipes of iron. The water-supply at Khartoum North and Omdurman is still unsatisfactory, but the chief wells at the latter have been protected, and there are no considerable water-borne diseases. It is hoped that a separate sanitary staff for Omdurman may be appointed.

With regard to infectious diseases various steps have also been taken, such as the setting-up of an infectious diseases compound at Khartoum North, and the distribution of printed instructions to phthisis patients on their discharge from hospital. A sanatorium for advanced cases is urgently required.

A serious danger to health is occasioned by the breeding of flies from stable manure; this manure, when dried, is much used as a rainproof plaster (*zibla*) for houses. The *zibla* also contains equine and bovine streptococci, which cause puerperal

fever and sore throat. There are already regulations in force with regard to it, e. g. a permit must be obtained for the making of *zibla* in Khartoum, Khartoum North, or Omdurman, and the manure has to be removed from the streets every ten days. But it is now found that this period is too long, as it allows the flies to breed out, and also it is known that natives store up the manure in houses and elsewhere; it is therefore felt that there should be a daily removal, and treatment with larvicide at a distance. This process, however, would make the price for plastering prohibitive; it is hoped that some substitute may be found.

### *Treatment of Infectious Diseases*

*Compulsory notification and isolation* of infectious diseases are measures beset with difficulty in dealing with a native population, but progress is being made. Experience has shown that the removal to a distance of sick and contacts is resented, and leads to concealment of cases, whereas the establishment of a local hospital and quarantine is welcomed, or at any rate unopposed. Mild cases are very seldom reported by natives. *Itinerant medical treatment and inspections* are carried out, and are invaluable for supplying aid to country places, for detecting suspected cases of such diseases as kala-azar, and for vaccinations. They are conducted by English and Egyptian medical officers, and by native 'sanitary barbers' in Government employ. Steps are being taken to ensure a higher degree of education and competence among these latter; they are receiving instruction in the symptoms of various diseases, and keep a register of births and deaths. The value of vaccination seems to be fully recognized by Arabs and negroes alike; nomads often come great distances for it. In 1917, 76,498 vaccinations were performed in the Khartoum district, and 20,915 in the Provinces of Kassala, Kordofan, Nuba Mountains, Blue Nile, Sennar, Mongalla, Upper Nile, and Bahr el-Ghazal. As many children must have been vaccinated previously, a very large percentage of the Khartoum district population must now be protected

against small-pox. The proposed floating dispensaries on the Nile will be of the utmost value in itinerant medical work. *Careful watching of frontiers* is kept up, to prevent the entrance of infected persons from e.g. Egypt, Abyssinia, or French and Belgian territory.

### *Hospitals and Dispensaries*

The following is a list of hospitals and dispensaries provided by Government ; a first-class hospital means a permanent building in red brick or stone, a second-class hospital a building in mud or red brick. Most dispensaries have a detention ward for use in emergency cases.

#### (1) *North*

##### *Halfa Province.*

Halfa. Complete quarantine station and infectious hospital.

Second-class hospital, 26 beds.

Abri. Dispensary.

##### *Dongola Province.*

Merowe. Second-class hospital, 34 beds.

Dongola. Second-class hospital, 21 beds.

##### *Berber Province.*

Atbara. First-class hospital, 59 beds. Isolation block.

A dispensary at : Abu Hamed, Zeidab, Berber, Wad Hamid, El-Damer, Shendi.

##### *Khartoum Province.*

Khartoum. First-class hospital, 83 beds.

Omdurman. Second-class hospital, 74 beds.

Khartoum North. Dispensary. Isolation hospital. Prison hospital.

##### *Red Sea Province.*

Port Sudan. First-class hospital, with infectious hospital, 53 beds. Quarantine station. Prison hospital.

Suakin. Second-class hospital, 14 beds. Prison hospital.

A dispensary at : Tokar, Sinkat, Erkowit, Dongonab.

*White Nile Province.*

Dueim. Second-class hospital, 20 beds.

Kosti. Second-class hospital, 13 beds.

*Blue Nile Province.*

Wad Medani. Second-class hospital, 85 beds.

Rufaa. Dispensary.

(2) *South*

The civil hospitals in the southern Sudan are under the administration of the P.M.O. of the Egyptian Army. In places where there is no civil hospital the work is done by the military M.O., and patients are treated in the military hospital or in temporary buildings. In the following list, which may be incomplete, it has not been possible to state the class of hospital; some are probably dispensaries only.

*Kordofan Province.*

El-Obeid, Nahud, Bara.

*Kassala Province.*

Kassala, Gedaref (civil), Gallabat.

*Sennar Province.*

Roseires, Singa, Kurmuk, Makwar.

*Mongalla Province.*

Mongalla, Rejaf, Nimule, Loka

*Nuba Mountains Province.*

Talodi.

*Bahr el-Ghazal Province.*

Wau, Rumbek, Yambio, Raga, Tembura, Meridi.

*Upper Nile Province.*

Kodok, Taufikia.

In 1914 it was stated that a hospital was required at Malakal, which would take the place of that at Kodok.

In addition to the above there are a few hospitals or dispensaries under the care of various missions, e.g. the

C.M.S. hospital at Omdurman and dispensary at Yambio ; an American mission station in the Sobat-Pibor region ; six dispensaries, as e. g. at Tonga, attached to the Austrian R.C. mission (suspended during the war), and a New Zealand mission dispensary at Melut.

For the sleeping-sickness camps see p. 510.

#### PREVALENT DISEASES

The following brief notes, alphabetically arranged, deal with some of the more important diseases prevalent in the Sudan ; some already mentioned, e. g. small-pox and malaria, are not further described.

*Ankylostomiasis* (*Hookworm disease*).—This is not indigenous in the Sudan, but appears to be rather on the increase. It is due to infection of the upper portion of the small intestine by minute worms, and is characterized by general weakness and anaemia. Infection is conveyed by walking barefoot on infected soil.

*Bilharziasis*.—This disease is fairly widespread in the central Sudan and very common in Egypt. The Egyptian troops in Khartoum are much infected by it. It is due to the presence of certain blood-worms in the veins which go to the kidneys and liver. Their spiny eggs cause chronic inflammation and bleeding. The intermediate host of the bilharziasis worm being a water-snail, infection is acquired by bathing or paddling in water containing infected snails or by drinking water infected by such snails. It appears certain that the infection is conveyed through the skin as well as by drinking. Heating water for a bath, or boiling it for drinking, destroys the minute worms. Once the condition is set up there is no certain cure yet known, though intravenous injection of tartar emetic has been said by some to be successful. The condition may last for many years.

*Blackwater Fever*.—This occurs all over the western and southern Sudan, though a condition closely allied to it (i. e. quinine haemoglobinuria) is much more frequently found. Blackwater fever is contracted only by those who have

suffered from repeated malarial attacks, or have neglected to take due care after such an attack. After some unusual exertion or exposure the patient feels unwell, has a shivering fit, and passes black water. This last is due to the breaking up of the red corpuscles in the blood and the passing of colouring matter (haemoglobin) through the kidneys, which are thus in danger of becoming blocked. Great weakness ensues. The patient should at once go to bed, and keep lying down there. He should not take quinine except under medical advice. The disease is serious, but, with such advice and with careful nursing, recovery is probable for a patient in good condition.

*Cerebro-spinal Meningitis* (Arabic *Abu ferrar*).—This disease, as already stated, is endemic, and liable to occur in epidemic form, especially between March and June. The dry, dusty season irritates the mucous membrane, and allows the meningococcus (*Neisseria intracellularis*), which may have been harmlessly present in the nasopharynx of many 'carriers', to gain access to the system; this, in the case of susceptible persons, causes the disease. Overcrowding, malnutrition, and want of ventilation are favouring conditions. Vaccine and serum treatment, with good food and nursing, are required; lumbar puncture has proved of value. Precautionary measures, when the disease is known to be about, include the avoidance of infection by towels or handkerchiefs, and the frequent irrigation of the nose by some sort of antiseptic lotion.

*Dengue*.—Dengue fever occurs in epidemic form in the northern Sudan, chiefly in the Red Sea Province, e. g. at Port Sudan and near the coast. It lasts for about a week, and is accompanied by severe pains in the limbs and sometimes by a rash on the skin. It is spread by certain mosquitoes (*Culex fatigans* and *Stegomyia fasciata*) and is highly infectious; recovery, however, is almost invariable.

*Guinea-worm* (*Dracontiasis*).—This disease is acquired by drinking water containing the minute crustacean called *Cyclops*, which is the intermediate host of the embryo guinea-



worm (*Dracunculus medinensis*). Here, again, the importance of boiling drinking-water is shown, though straining it through muslin or cotton cloth will filter off the *Cyclops*. Those who drink from deep wells do not suffer from it; contradictory opinions are expressed as to the safety of water stored in *tebeldi* trees. The natives are persuaded that infection can enter through the skin of the feet, and often wear wooden pattens as a precaution. A year after infection one or more full-grown worms containing embryos appear under the skin. They may be about two feet long, and cause a blister, often about the ankle. When this breaks the worm may be carefully and gradually withdrawn; this is a long and difficult process, and should never be attempted until the worm has discharged its embryos. The disease may involve much disability, but is seldom dangerous. It occurs in Gedaref, and is very common in Gallabat, on the Upper White Nile, in the Bahr el-Ghazal and Kordofan. It is less frequent on the Blue Nile. There was an outbreak in the Red Sea Province in 1913, due to an infected well.

*Kala-azar*.—See below, under Leishmaniasis.

*Leishmaniasis*.—Two forms of infection by the parasite *Leishmania donovani* are found in the Sudan: (1) *kala-azar* and (2) Oriental sore.

(1) *Kala-azar* (Arabic *Simeih*, *Marad el-seyid*, *Abu safar*) is a prolonged and irregular infectious fever accompanied by great enlargement of the spleen and liver and characterized by progressive wasting and anaemia. The Sudanese type is more fatal than the Indian or Mediterranean. *Kala-azar* appears mostly at the end of the rains; there are various theories as to the transmission of the blood parasite, the bed-bug, drinking-water, fish diet, and the flea having been all incriminated; the last appears the most probable. There are both an acute and a chronic form of the disease, the first being almost entirely confined to younger patients. The average duration is three to five months; case mortality is about 96 per cent. Intravenous injections of sodium antimonyl tartarate have been given with success; this is less irritating than tartar

emetic. As precautions in an infected area huts and villages should be destroyed (paying compensation) ; native bedsteads and huts should be avoided by Europeans and their servants ; bed-bugs should be destroyed (a day's exposure to the sun will do this) ; natives should be urged to discontinue keeping animals in their huts at night ; any native officials or servants showing suspicious symptoms should be isolated.

(2) *Oriental Sore* (Cutaneous Leishmaniasis) is the same as the 'Baghdad boil', and is fairly common in the dry, northern Sudan. The parasite is *Leishmania tropica*, and is probably conveyed by the sandfly (*Phlebotomus*). The sores differ in character (e. g. ulcerating or not), and may last for sixteen or more months. They may be treated by painting with various substances such as carbonic acid snow, by injections, or by excision ; the same injections as for kala-azar are probably the best treatment.

*Madura Foot*.—This disease (*Mycetoma*) is characterized by chronic enlargement and deformity of the foot (or occasionally the hand) and by fungoid excrescences which internally destroy joints, cartilage, and ligaments. It is common in the northern Sudan. The exact method of infection is unknown, but thorns and other foreign bodies have been found in the tumours ; walking barefoot should be avoided. The only treatment is excision of the growth when small ; if large, amputation may be necessary.

*Malaria*.—See above, p. 494.

*Malta Fever* (*Undulant Fever*).—This is due to a minute bacillus (*Micrococcus melitensis*) found in the milk of apparently healthy goats and, less commonly, in other domestic animals. It is a chronic fever of long duration, accompanied by rheumatic-like pains, marked emaciation, and anaemia. The undulant type of temperature is very characteristic, and explains the name. It is contracted from drinking infected milk unboiled, or eating infected butter, or from contamination of food or water by dust from the dried excreta of infected animals. It is found chiefly in Kassala Province and the northern districts. Milk should always be boiled.

*Phlebotomus Fever*.—This is often called sandfly fever, from the *Phlebotomus* fly that conveys it (see p. 514). The fever is not severe, and lasts for four to seven days.

*Sleeping-sickness* (Arabic *El-marad el-noom*).—This is the only form of human trypanosomiasis which has appeared in the Sudan. It is conveyed by the bite of the tsetse-fly, of which there are several species, all peculiar to Tropical Africa. A distinguishing feature of these flies is the projection of the wings, close-folded like shut scissors, beyond the end of the abdomen, while the stout, biting proboscis projects in front. The infective human trypanosome in the Sudan is *Trypanosoma gambiense*. This, as the name implies, has been imported, and the disease does not appear to have been endemic in the Sudan. The Lado Enclave had been infected before it was handed over by Belgium. It is not yet certain whether *Glossina palpalis*, the fly chiefly transmitting the disease to man in other parts of Africa, has been found in the Sudan; a species named *fuscipes*, which has been found, is under investigation, and may perhaps be a form of *palpalis*. *Glossina morsitans*, the fly that infects animals, is found in large numbers in the Bahr el-Ghazal, and in the Koalib region of southern Kordofan, where it lives in the hedges. A small black breed of bull is said to be immune and to be the only type that can live there; the infection is probably *Trypanosoma brucei*. In western Mongalla, and among the Shilluk, cattle, mules, and other animals are found to be infected by *Trypanosoma nanum* (also called *pecorum*). It appears fairly certain that man may be bitten by *morsitans* without developing sleeping-sickness (though the contrary is the case in Nyasaland), whereas animals die of its bite; it can live on large or small game (antelopes, bush-buck, and others) or on monkeys, and does not cling to the neighbourhood of water, to shade, and to low ground as *palpalis* does. There are several other species, e. g. *Glossina longipennis*, *Glossina pallidipes*. It also appears that animal trypanosomiasis may be conveyed, in the absence of *Glossinae*, by some of the *Tabanidae* (serut flies) e. g. *fuscipes* and *taeniola*, *Haemato-*

*pota* e. g. *Stomoxys calcitrans*, and mosquitoes (cf. Diseases of Animals, p. 511).

In districts affected by the tsetse it is important to avoid visiting its haunts by day, bathing in a shaded river, or camping within 300 yards of one; if a ford must be crossed, as little bare skin as possible should be exposed. If the banks of the water are stripped of vegetation the *palpalis* fly will disappear till this has grown again. Unlike *morsitans* it rarely bites except when the sun is hot (8 a.m. to 5 p.m.), and not on dull or rainy days; it attacks dark skins more readily than white; the wearing of white clothing is some protection. As the bite is often on the neck, a silk handkerchief hanging down over this may also be a protection. European women should protect their legs.

The first symptom of the disease is an attack of fever, often supposed to be malaria, within a fortnight of being bitten; other attacks follow, with intervals of comparatively good health. Later on the glands of the neck become enlarged, acute headache and delirium supervene, and the last stages exhibit the drowsiness from which the disease derives its name. This drowsiness can be at first resisted to some extent, but gradually becomes overmastering. Muscular power is much diminished. The serious nervous symptoms begin when the parasites invade the nervous system. If the disease is detected early, by the recognition of the parasites in the blood, the patient can be treated with some chance of recovery; over fifty cases have recently recovered in the Sudan. Otherwise it usually ends fatally, after a duration varying from a few months to three years.

It is only since 1909 that sleeping-sickness has been notified in the tropical areas of the Sudan; the cases have been mostly infected by immigrants from French or Belgian territory, or from Uganda, and the disease has been of the characteristic Uganda type. Regulations previously drawn up for the Bahr el-Ghazal and Mongalla Provinces were in 1913 made more stringent, and strict investigations have been carried on in those provinces by the Sudan Sleeping-sickness Com-

mission. In 1914 there were about 400 cases in Yei camp, and about the same number in the Kajo-Kaji district, with others at Rejaf and Nimule (the latter imported). The banks of the rivers where the fly *fuscipes* (? or *palpalis*) was found, e. g. the Yei, the Tor, and their tributaries, have since been systematically cleared of vegetation; inspection posts have been established at Yambio, Meridi, and Mvolo (all in the southern Bahr el-Ghazal), on the main trade routes from the French Congo, e. g. Dem Zubeir, Sabun, and Said Buldas, and at Mongalla; isolation camps have been set up at Raga and Dem Zubeir (both in the northern Bahr el-Ghazal), and a good hospital built at the Yei camp. The crews of boats coming from the south of Mongalla northward are inspected and, if necessary, detained. The inspection of all natives has been thus secured, except of refugees, who avoid the main roads; local sheikhs and sultans have been accordingly warned of the danger, and instructed to bring all newcomers to their villages to the Government posts for medical examination. Infected persons from French or Belgian territory are detained, or returned whence they came.

*Yaws (Framboesia).*—This is a tropical contagious skin disease of a chronic type found all over the southern part of the White Nile district and among the Shilluk of the Upper Nile; cases have occurred at Kassala and elsewhere. Children are chiefly affected. Flies transmit the spirochaete of yaws (*Treponema pertenue*). The giving of antimony by the mouth, and treatment by salvarsan and yaws serum have proved successful remedies; the ulcers should be antiseptically treated.

*Native Medicine and Surgery.*—The natives, both Arabs and negroes, have their own methods for the treatment of disease; these are largely empirical or magical, often barbarous. A detailed study of those in use in Kordofan and Kassala will be found in the Third Report of the Wellcome Research Laboratories (1908), and of some in the Bahr el-Ghazal (Nyam-Nyam and Gur peoples) in their Fourth Report (1911). Charms, philtres, and invocations are much employed, with

outward applications of earth, leaves, and so forth, and internal decoctions of the same, and of various herbs, with hot butter. Serious injury or death often follows their ignorant practices ; their surgical instruments are of the simplest, but they can, for example, make good splints, and have, no doubt, some useful knowledge of herbs. As usual among primitive peoples, the eating of parts of certain animals, e. g. the crocodile, is supposed to confer courage, virility, or other desired qualities.

#### (4) DISEASES OF ANIMALS

Animals in the Sudan suffer considerably from insect pests (see above, under Sleeping-sickness, and below, under (5)), and from internal parasites. Horses, asses, and mules often suffer, sometimes fatally, from digestive diseases due to eating sand (in the northern Sudan) or wet grass (in the south). All animals are liable to hydrocyanic poisoning from eating green dura. Several grasses and other plants are poisonous (see *Flora*). Both camels and sheep are liable to a severe form of pneumonia, contagious, and often fatal. Camels have a number of diseases, e. g. scabies, internal abscesses, camel-pox, pharyngitis, and exhaustion ; this last results from being taken long distances beyond their normal pace, and often ends in death. Goats suffer from a serious intestinal disease called *coccidiosis*.

The following are among the more serious and common diseases, in alphabetical order :

*Babesiasis*.—See under *Piroplasmosis*.

*Cattle-plague* (*Rinderpest* ; Arabic *Abu dama*, *Taun*).—This was prevalent in e. g. 1913–14. It is frequently fatal. It affects cattle in every part of the country. Anti-cattle plague serum should be used, and quarantine measures taken (see below).

*Contagious Pleuro-Pneumonia of Cattle* (Arabic *Abu geneit*).—This also was prevalent in 1913–14. The disease is characterized by a dry cough. It may be treated by inoculation.

*Epizootic Lymphangitis* (Arabic *Sarraga*).—This highly

contagious and often fatal disease affects mules, donkeys, and occasionally horses. It yields to drastic treatment. The symptoms are small abscesses in a connected series. It occurs in the area of Khartoum and the Provinces south of it. Mules imported from Abyssinia are chiefly affected, and bring in the infection.

*Foot and Mouth Disease* (Arabic *Abu lisan*).—This is a disease of cattle, sheep, and goats, found also in many wild animals. It is endemic in the Sudan, and appears most frequently in wet, cool, years. It usually takes a very mild form.

All the above infectious epidemics require strict measures of isolation of healthy beasts, disinfection of harness, stables, &c., in some cases the destruction of sick animals and the burning of their carcasses. The authorities should at once be notified of any outbreak.

*Horse-sickness* (Arabic *Nigma*).—This disease is usually rapid in its onset and fatal ending. Treatment is of no avail, but the following precautions should be observed during the rainy season, when it is most prevalent : horses when possible should be kept in their stables between sunset and sunrise and not watered between 6 p. m. and 9 a. m. ; stables or pickets should be at a distance from standing water or a river ; vegetation round them should be cleared away and stables made fly-proof. These last precautions are aimed at mosquitoes and flies, which may possibly be agents in the spread of the disease. Green forage should be sun-dried, fires kept burning, and disinfectants freely used. Syrian horses are more susceptible than those bred in the Sudan. The disease is often fatal to mules.

*Piroplasmosis*.—This disease affects horses, sheep, and dogs. The micro-organism is transmitted by ticks of the *Rhipicephalus* order, especially *Rhipicephalus evertsi* ; these abound in the southern Sudan. One group of piroplasmata being known as Theileria, the variety of fever conveyed by them is called Theileriasis. Cases occur sporadically, and it probably causes an appreciable number of deaths among calves.

In spite, however, of the abundance of ticks generally in the Sudan, there is on the whole very little malignant jaundice or tick-fever (*Babesiasis*) among horses, mules, asses, and cattle; they have presumably acquired immunity through long exposure.

*Trypanosomiasis* (Arabic *Dabana*, *Nagana*).—This disease affects camels, mules, cattle, horses, asses, and sheep, and is caused by a blood-parasite conveyed by the tsetse-fly (*Glossina morsitans*), and possibly by the serut and others. It is most prevalent in the season following the rains, when these flies are most aggressive, and exists to a considerable extent in the Bahr el-Ghazal and Upper Sobat. It does not occur north of Khartoum, except in the southern part of the Red Sea Province. A general loss of condition in the affected animals is sometimes followed by paralysis; death almost always ensues. No cure is known, and the animals should be destroyed. As a precaution fly-infested areas should be avoided as much as possible; marching in them should be done at night, the flies being day-biters; smoke fires should be kept up. The giving of one or two grains of white arsenic on the tongue daily seems to be a preventive. Transport animals suffer severely; Syrian mules and horses die rapidly in the infected areas; Abyssinian mules are said to be less susceptible. Cattle in the grazing areas appear to have acquired a certain degree of immunity to trypanosomiasis by long exposure through preceding generations, and, though they often carry the parasite in their blood, do not exhibit any ill effects from it. Camels, on the contrary, suffer severely from the disease in all Provinces south and east of Khartoum, and mortality is high among them. The administration of arsenic is less successful in their case than in that of other animals, and more difficult; they should, if possible, be removed to higher ground, where there are fewer flies.

#### (5) INSECTS AND OTHER PESTS

In addition to the mosquito and tsetse the Sudan suffers from hosts of biting and stinging flies, only a few of which



can be mentioned here. There are also blister-causing beetles, biting ants and spiders, and so forth. A fuller account will be found under *Fauna*, where also a description of the snakes and scorpions mentioned below is given.

*Flies*.—Various gadflies (*Oestridae*).

*Sandflies*. This name has been applied, though incorrectly, to the *Simulidae* (q. v.), whereas the true sandfly is the *Phlebotomus*, the vector of the so-called 'sandfly fever'.

*Phlebotomus*.—The *Phlebotomus* fly is a tiny owl midge or moth-fly. Two species are known in the Sudan, *Phlebotomus papatasi* and one as yet unnamed. Their breeding-places are the crevices in walls, between loose stones, and similar haunts.

*Simulidae*.—These are biting and blood-sucking flies which cause great irritation to men and beasts, flying into their eyes, and driving them out of the districts that they haunt. Two of the worst species in the Sudan are the *Simulium griseicollis* (Arabic, *nimetta*), which breeds among the rocks of the Nile Rapids and infests Dongola Province in the spring, and that appropriately named *damnosum* (Arabic, *kunteb*).

*Tabanidae* (Arabic *Serut*).—There are many species of these, e. g. *Tabanus taeniola*, *Tabanus socius*, *Tabanus suffs*, *Tabanus mordax*, *Tabanus dorsivitta*, *Tabanus africanus*. The last is brilliantly coloured. One peculiarly trying species (? *taeniola* or *socius*) is called *agheibish* by the natives. These serut-flies sting fiercely in the day-time, especially during May and June; they breed in thickets and woods. Under their persistent attacks slight fever is often induced in human beings, while beasts, especially camels, lose condition and often die. In infested districts such as those round Gallabat, Gedaref, and Kassala camels must be removed after the rains, and such cattle as remain must be shut up. At least two forms of trypanosome, *Trypanosoma vivax* and *Trypanosoma evansi*, are believed to be conveyed by the serut; the former infects cattle in Kassala Province, the latter camels in Kordofan and east of the Nile. *Tabanus taeniola* is the most common; it is a vicious blood-sucker and will follow animals inland

for several miles, and board steamers. Its larvae are cannibalistic.

**Maggot fly** (*Cordylobia anthropophaga*).—This is found in the Bahr el-Ghazal. It lays its eggs under the skin of men and beasts, and in neglected wounds, also in clothing or bedding, and causes cutaneous inflammation, and often fever, the maggots being spiny. They usually come out in about a fortnight, leaving a scar on the skin. The Congo floor-maggot fly (*Auchmeromyia luteola*), the larva of which is a blood-sucker, is a pest in the southern Sudan.

**Forest flies** (*Hippoboscidae*).—These are parasites on animals, and may in some cases be connected with the dissemination of trypanosomiasis.

**Jigger or Chigger** (*Sarcopsylla penetrans*).—This is a sand-flea found in the tropical zone. It has been imported into the Sudan from the Congo and Uganda. The female burrows under the skin of the foot and there lays its eggs. Intense irritation is caused. The jigger can be extracted with a knife or sharpened stick; natives are expert at this, and at detecting its presence. Walking barefoot should be avoided in southern Mongalla and the Bahr el-Ghazal, and the feet carefully examined every day. A preventive measure consists in rubbing in a mixture of five drops of lysol (or liquor cresol saponatus) in one ounce of vaseline.

**Scorpions**.—Eleven species of scorpion are found in the Sudan, divided between the two genera *Buthus* and *Pandinus*. They are most numerous in the arid northern deserts, but the huge *Pandinus imperator* is found in the tropical Bahr el-Ghazal. The actual bite of a scorpion, though painful, is not dangerous in itself, but poison is sometimes ejected from glands in the tail which is fatal to smaller animals and, occasionally, to man. The wound should be treated like snake-bite (see below). Scorpion serum should be used.

**Snakes**.—In addition to a number of harmless snakes there are eight poisonous species in the Sudan, none exclusively Sudanese. Two of these are restricted to the northern desert regions and four to the tropical zone, the rest being found all

over the country. They may be divided into *colubrines* and *vipers*. Among the *colubrines* are two belonging to the highly poisonous genus *Naja*, *Naja haje*, and *Naja nigricollis*, sometimes, though incorrectly, termed 'spitting cobras', the fluid ejected from their jaws having been proved to be not saliva but the actual venom. If this spatters the eyes, intense pain and sometimes temporary blindness are caused; the eyes should be washed out with warm milk or olive oil. Among *vipers* are the *Causus resimus*, known as the 'green viper', common on the banks of the River Sobat; the *Bitis arietans* or 'puff adder', found all over the country; the horned asp (*Cerastes cornutus*), found in the northern sandy regions only; the *Echis carinatus*, common in e. g. Kordofan.

*Snake-bite*.—The following procedure should be adopted in the case of snake-bite or scorpion-sting. The wound should be at once sucked, and a bandage tied tightly round the limb above it. The flesh over the wound should be cut and pure crystals of permanganate of potash rubbed in. A small tube containing a lancet and crystals for the purpose (Lauder Brunton's lancet) can be bought from the head-quarters of the Sudan Medical Department, or at several of the hospitals. Good results have been obtained with Calmette's anti-venene, plus the local use of permanganate of potash. The patient should be kept lying down, and brandy or stimulants should be given freely if required.

*Ticks (Ixodoidea)*.—Twenty-one species of tick are known in the Sudan, including the human tick (*Ornithodoros savignyi*) and those called *Hyalomma aegyptium* and *Amblyomma variegatum*, both found chiefly on camels and mules. Fowls are much attacked by the tick *Argas persicus*, which transmits the often fatal disease spirochaetosis; tick-proof fowl-houses should always be erected.

#### WATER-SUPPLY

The conditions of water-supply in the Sudan naturally vary with the widely different physical characters of the several zones. Throughout the country the chief source of water

lies, of course, in the great rain-fed rivers and their tributaries, including khors which run only during the rains. Near these, and in the irrigated basins, there is always water in abundance. In the northern desert regions (e. g. Libyan, Nubian, and Bayuda deserts and northern Kordofan), water is extremely scarce, being derived from scattered wells only. The Government are endeavouring to augment the supply in such regions by the construction of new wells and the improvement of those already existing. Where there are mountains, as between the Nile and the Red Sea, water is obtained from the khors draining them, from wells dug in the beds of those khors when dry, or from natural rock-basins (*galts*) in the mountain gorges. In the central regions, especially as one approaches the south, the heavier rainfall ensures a more lasting supply in wells and pools (*fulas*), and it is collected also in tanks (*hafirs*) and in the hollow *tebeldi* trees. South of Khartoum cultivation depends almost entirely on rainfall. In the south great tracts of swamp and moist savannah dry up rapidly after the rains, largely owing to evaporation and quick drainage; water is scarce, and animals flock from a distance to the Nile to drink. Well-water is often preferred by natives to that drawn straight from the river. In some parts of the Sudan, as e. g. at Jebel Kassala, Jebel Keili, and among the Nuba Mountains and those of northern Kordofan, natural springs are found. At Port Sudan and Suakin drinking-water is partly obtained from salt-water by a condensing apparatus.

The question of a pure supply for the towns is receiving serious attention from the Government. Until recently, the water drunk in all of them would not have satisfied, and still in the case of many would not satisfy, any bacteriological test of purity. Every precaution is now being taken to prevent contamination of river-water and of wells by town sewage, the fouling of foreshores, or the breeding of mosquitoes. Upper strata are cut off, wells are deepened, and underground pipes introduced, as at Suakin and Khartoum. Khartoum has now an excellent water-supply (see p. 709). The Blue

Nile water is better for drinking purposes than that of the White Nile.

The different sources of water-supply will now be described.

(1) *Rivers and Lakes*.—The methods of drawing up-river water by *shadufs*, *sakias*, and pumps, and of extending it by canals, are treated under *Irrigation*; the great rivers under *Physical Geography*. The torrential rivers and khors afford running water for several months of the year, after which wells are dug in their beds. The small lakes of Kordofan and the Nuba Mountains (Keilak, Rahad, Sherkeila and others) similarly give surface water, or water from wells in their beds when they dry up.

(2) *Natural Springs, Pools, and Waterholes*.—Springs are fed by rainfall on a higher level, which percolates the rocks and comes out on a lower level. They are usually affected by drought, but not until some time has elapsed, and their water is often purer than that of the wells. Basins are often dug near them, from which the camels can drink. A spring is properly called *ain* in Arabic, but the name *bir*, i. e. well, is sometimes applied to it; this seems to be the case with the water at the oasis of Bir Sultan in the Libyan desert. In addition to the springs already mentioned, there are some at Gallabat and at Jebel Abu Gamal, south of Kassala. The springs among the Nuba Mountains are sometimes at the foot of the hills, sometimes in the rocks on the slopes and summits; the supply is drawn from surface water and is uncertain.

Natural holes or pans, deep or shallow, containing water, are found both in sandy districts and among the mountains. In the former they may hold river or salt water by infiltration, if near a river or the coast; in both cases they may hold rainfall. The surface water in the pools (*fulas*, *sarafs*) soon evaporates and dries up; shallow holes are then dug to obtain it as it recedes. These are called *tamad* in northern Kordofan, and last for a month or so. The Dinka round Bor dig a series of circular holes, two or three feet deeper than the *fula*, round its circumference, and drain off the water as it decreases into them. The holes are then thatched with

dura stalks to diminish the loss by evaporation. There are a great number of *fulas* throughout the Bahr el-Ghazal Province, but in many cases, there and elsewhere, the water obtained from them is really fit for animals only.

Artificial *fulas* are sometimes made by damming a khor. In Darfur, the water-supply on the northern route, El-Obeid—Nahud—Abiad—El-Fasher, is being improved by conservancy experiments in enlarging *fulas* and building storage tanks.

A more satisfactory supply is yielded by the rock-basins (*galt* plur. *gulut*) formed by cracks and fissures of rock on mountain sides or in the rocky floor of steep gorges draining them ; they are often difficult of access. When large, they are called *makhzans*, when small, *gammam*. They vary considerably in size and content. They are generally due to pot-holing on a large scale, and are oftenest found in eruptive rock. Less evaporation generally takes place from them than from wells or *fulas* in the open country, as they are sheltered for a great part of the day from sun and wind in narrow gorges. The quality of their water varies ; in some rocks (e. g. serpentine), magnesium and other salts make it bitter and purgative, though to a less degree than in some wells. Sandstone *galts* hold the purest water, owing to their siliceous nature and to the fact that, being permeable, they are comparatively quickly emptied. Examples of these rock-pools may be found on Jebel Kuror, between the Nile and the Abu Hamed railway ; on Jebel Rafit, near Murrat ; among the Red Sea maritime range, and among the hills of northern Kordofan.

(3) *Artificial Wells*.—Wells are of vital importance to the Sudan water-supply ; their position determines the course of desert routes. A series of them marks, for example, the routes between Berber and Suakin and between El-Dueim and El-Fasher via El-Obeid. The supply in the deeper ones is fairly constant and reliable, lasting in some throughout the year. For the sites of the more important wells see under *Routes* and *Physical Geography*.

The wells vary considerably in situation, in depth, and in

the quality of their water. They may be dug in the dry beds of torrential rivers, wadis, or khors; such wells are shallow, but need digging deeper as the dry season continues. Those in the Atbara, Baraka, Gash, and Khor Arbat are good examples. Wells may be dug in the soil or rock bordering a river; their water is then in many cases due to seepage. The wells in the alluvial soil along the Nile give an abundant supply. Some cut in the Nubian sandstone between Wadi Halfa and Khartoum are from 200 to 300 ft. deep. Wells are found among the sand-dunes of the Red Sea coast, usually brackish or salt, and, after rain, in sandy depressions, such as the Wadi Mogaddam. They are scattered over the deserts, in sand or rock, away from any water-course; they depend on an underground supply. Those at Selima Oasis are only a few feet in depth; such shallow, sandy wells tend to fill up rapidly and to need re-excavation. There are also wells cut into or through rock-strata; the first are called in Kordofan *adad* (sing. *id*) or *abiar*, the second, *sowaniya* (sing. *saniya*); these give the best and most reliable supply. *Adad* and *sowaniya* are found side by side at several places, e. g. Bara and Kaga, in northern Kordofan. Two very fine *sowaniya* wells, 100 ft. deep, are found to NW. of Jebel el-Haraza, and another on Jebel Kobe, also in northern Kordofan. Rock-wells are often deep, sometimes from 200 to 300 ft., but not necessarily so, as in the Gedaref district, where water is found at small depths in the soft, basaltic rock. Water is hoisted up from deep wells and poured into mud basins (*hods*) from which animals can drink.

Surface wells are only possible where there is some appreciable rainfall, and hills or mountains near by with drainage channels. These conditions are found in the mountainous country between the Nile and the Red Sea. The great khors here collect the drainage of many small ones; the deeply carved valleys in the crystalline rocks are filled with gravel and detritus, forming a permeable deposit known as 'Valley Fill', which absorbs the water from the khors after rain, and is readily tapped by wells. The shallow wells in the Khor

Arbat, at Okok and other places in the Suakin district, are examples of this.

Water as a rule is obtained nearer the surface on the east of the Nile than on the west.

The 'cotton soil' which covers a great part of the central and southern Sudan becomes a regular swamp in the rains, but soon dries up. Owing to its impervious nature wells can be dug in it only where permeable rocky strata, usually igneous, emerge. This is the case at Geili and several other well-sites between Khartoum and Kassala, where water is found at from 50 to 60 ft., and in the Gedaref district already mentioned.

In northern Kordofan remarkable alterations are taking place in the underground water-supply; the old watering places, e. g. Foga and Um Badr, show a noticeable decrease, while fresh sites are now and then discovered. For the last fifty years or so it has seemed to be necessary to dig deeper for water than previously.

The water in some of the wells, especially in sandstone, is good. But in many, e. g. in some round Selima Oasis and on the Berber—Suakin route, it is brackish, salt, or bitter, acting in some cases as a mild aperient, in others as a strong purgative. This may be counteracted by mixing milk with it. In a few instances, e. g. a well near Nahud, the water has been found actually poisonous, through excess of nitrates. Usually, as the wells are dug deeper, the water is found more and more impregnated with salts,—sodium, calcium, or magnesium. These are most pronounced among basic rocks like serpentine, less so in granite, and almost absent in sandstone. Camels are able to drink very bitter (*murra*) water.

Shallow well-water is often fouled by animals or by the falling-in of soil from the sides of the well. This is especially so in cases where, as in the Nuba Mountains, the natives do not understand the digging of wells, and they are not much more than rough holes. Sometimes the sides are lined with tree-branches or trunks, with a kind of grass rope, or with stone. The natives as a rule have been lazy and neglectful



in the care of wells, but the Government is remedying this. Money is set aside yearly for the sinking of new wells and the clearing out or lining of old ones. Wells have been dug to a depth of about 100 ft. in the Nubian sandstone near stations 4 and 6 of the Halfa—Abu Hamed Railway. (The neighbouring Murrat wells are probably in crystalline rock.) Others have been sunk near Government posts in the Provinces of Kordofan, the Nuba Mountains, and Kassala; for instance, during the last five years, at Um Ruaba, Abu Haraz (lined), and Jebel Oreil (all in Kordofan), at Akala (210 ft., lined throughout), and other sites in Kassala Province, and at Jebel Gerri in Sennar, on the route to Abyssinia. The digging of wells by private individuals in towns is discouraged, as, without proper supervision, they breed mosquitoes.

(d) *Reservoirs* (tanks, *tebeli* trees).—The storage of rainfall is very necessary in districts where wells are few and far between. Stone tanks (*hafirs*) are specially common in the northern parts of the 'Island of Meroe' and of the Gezira. In some cases they are roofed with thatch to prevent pollution or evaporation. In some districts, e. g. Dar Hamar, the inhabitants depend almost entirely on the rain stored in the *tebeli* trees. In western Kordofan alone there are said to be at least 200,000 of them. (For a description of these trees see *Flora*, p. 106.) The tree-reservoir is often 20 ft. deep, and the water stored in it remains sweet to the end of the hot season, so that good trees are a valuable form of property, and are let or sold with or without the adjacent land.

## CHAPTER XII

### COMMUNICATIONS <sup>1</sup>

Inland waterways—Table of distances by river—Railways—Roads and tracks—Table of distances by road—Methods of transport—Postal and telegraphic Facilities—Harbours, anchorages, and beacons.

THE principal natural line of communication and trade route in the Sudan running through the whole country from north to south is that of the Nile (main Nile, White Nile, and Bahr el-Jebel).

Another natural line of communication is provided by the Blue Nile roughly parallel to the White Nile but trending rather easterly from Khartoum towards Fazogli and the Abyssinian frontier.

The other water-courses of the Sudan may be regarded as means of communication subsidiary to the Niles and feeding or distributing laterally to them some of the traffic and trade which they carry. The Bahr el-Arab ought to be an important means of communication with the western districts of the Sudan, but is blocked with sudd in its lower course.

The natural line of the greater waterways is to a great extent that followed by the railway with lateral extensions from that line. After running across the bend of the Nile from Halfa to Abu Hamed (with a light railway extension at No. 6 station to Um Nabardi gold-mine), it sends out, from a little north of Khartoum, a branch south-west along the right bank of the Nile to Kareima. From Abu Hamed to Khartoum it runs along the right bank of the Nile, following its sinuosities closely. From Atbara there is an extension of the railway north-east to Port Sudan, with a branch line to Suakin, the farthest eastern extension of the system, which, continuing now along the left bank of the Blue Nile

<sup>1</sup> See also Appendix II for table of progress of Railway and Steamer services during 1915-1919.

from Khartoum to Sennar, throws out from the latter point an extension west to El-Obeid, the farthest western extension of the system and also its present extreme southern limit. (See further 'Railways' p. 534 below.)

The land routes also present in the main the feature of being lateral extensions of the main Nile routes. An apparent exception is the Arbain caravan route north-north-east from El-Fasher which runs roughly parallel to the Nile in its course through the Sudan, only, however, eventually to reach that river at Asiuṭ in Egypt. A more real exception is the series of roads along the coast of the Sudan and on to Kassala and up to Gallabat. Thus there is communication via Mohammed Gul between Haleib and Port Sudan and on to Karora on the Eritrean frontier. By the road between Tokar and Trinkitat cotton is taken to be shipped for ginning at Suakin and Port Sudan. Tokar is connected on the other side with Kassala.

### INLAND WATERWAYS

#### *Steamer Navigation on the Nile*

In its course of roughly 2,160 miles through the Sudan, the Nile is regularly navigated by steamers for a little over 1,300 miles. This distance consists of two stretches—the smaller about 207 miles in length situated north of Khartoum between Kerma and Kareima, and the larger by far, in length roughly 1,100 miles, extending continuously from Khartoum up the White Nile and Bahr el-Jebel to Rejaf. Beyond Rejaf to Nimule there is an unnavigable stretch. Nimule is the northern terminus of the steamer service running to Butiabu on the Uganda side of Lake Albert. In the north connexion with the Egyptian system of communications is effected by Sudan Government steamers on a navigable stretch between Halfa and Shellal.

*Kerma-Kareima.*—On the Kerma-Kareima reach there is a post-boat service every 14 days from November to May; the journey takes a little over 48 hours. Calls are made at Dongola, Merowe, and at intervening villages. The channel

north of Dongola was cleared only immediately previous to the outbreak of war, and, according to the Sudan Almanac of 1917, the mail north of Dongola is carried during Low Nile by camel. However, during the exceptionally low river of 1913, it was found possible to maintain the river service throughout. A launch connects Merowe with Kareima, five miles up stream, the terminus of the branch line from station No. 10 near Abu Hamed.

*Khartoum-Kosti-Rejaf.*—Between Khartoum and Rejaf there are two regular services—one from Khartoum to Kosti and back, the other from Khartoum to Rejaf and back. These are maintained throughout the year. Steamers leave Khartoum for Kosti four times a month. Calls are made at Geteina, El-Dueim, and Kawa ; the journey takes a day and a half. The importance of this service has diminished since the railway from Khartoum via Sennar and Kosti to El-Obeid was constructed.

Twice a month steamers leave Khartoum for Rejaf. The normal route is by way of the White Nile and Bahr el-Jebel. In the neighbourhood of Lake No there is an alternative route for steamers along the Bahr el-Zeraf which has been connected by canal at its southern end with the Bahr el-Jebel. The journey takes a day or two over a fortnight and the return journey takes a day or two less (11 days). During very Low Nile the boats have been as much as five or six days overdue, and barges and steamers of light draught had to be maintained for the purpose of assisting navigation.

There is occasional steamer navigation at High Nile between Berber and Khartoum, chiefly by station gunboats and vessels used by the Administration.

### *Other Navigation on the Nile*

Serious difficulties presented to navigation on the Nile are confined to that part of the river, between Halfa and Khartoum, in which the cataracts occur. Steamers and boats have on occasion been taken over all the cataracts at High Nile, but excepting at the 5th and 6th cataracts, not without serious

difficulty. The construction of the railway to Khartoum has obviated the necessity of maintaining, even if it were possible, a regular steamer traffic. Communication on this part of the river, therefore, is by native sailing boats, such as the *nugger* and *gyassa*. Navigation conditions for them vary in different reaches. At Gamai 14 or 15 miles up stream of Halfa native boats discharge their cargoes which are transported to Halfa by camel. Between Gamai and Kosha, a distance of about 100 miles, sailing boats ply at some risk all the year round. From Kosha to Delgo, nearly 80 miles to the south, boats can navigate with ease at High Nile and with some difficulty at other times. South of Delgo as far as Kerma navigation at Low Nile is impossible except for restricted distances. On the Nile beyond the intervening Kerma-Kareima reach the river between Kareima and Abu Hamed is seldom navigated even by native boats, and between Abu Hamed and Berber passage is only possible at High Nile. Southward of Berber between El-Damer and Khartoum there is a fairly brisk carrying trade in native vessels.

### *Navigation of Nile Affluents*

Most of the larger Nile affluents are used for purposes of communication, the Atbara being the notable exception. Regular steamer services, either seasonal or continuously throughout the year, are maintained on the Blue Nile, the Sobat, and the Bahr el-Ghazal.

*Blue Nile.*—On the Blue Nile between Wad Medani and Roseires there is a regular steamer service from the middle of June to the middle of September. The distance is roughly 275 miles. Difficulties for navigation occur near Shellal Abdin, 25 miles south of Sennar, where there is a reef of rocks, and at a point 5 miles below Roseires where rocks are also met with. It is possible for sailing boats to navigate as far as Fazogli.

*Rahad.*—The Rahad, tributary of the Blue Nile, has been navigated by a tug for 420 miles from its confluence with the main river. In recent years tugs have during high river in

August reached Khor Simsim. The difficulties of navigation are rocks, overhanging branches, and trees growing in the river. The work of clearing these obstructions began in 1917. An experimental service of tugs and barges during flood has been tried.

*Sobat.*—The Sobat and its tributary or continuation the Baro can be navigated by steamers drawing 3-3½ ft. to within 30 miles of the Bure scarp for the last eight months of the year. Flat-bottomed boats ply for an even longer period. In years of exceptionally low river, however, the period of navigability has been reduced to four months. During the season from June to November a steamer runs once a month from Khartoum to Gambeila, 891 miles away, on the Baro. The Sobat's tributary, the Pibor, is navigable up to Akobo Post and even beyond as far as Pibor Port from June to December. The Akobo, a tributary of the Pibor, is also navigable for some distance during the same period.

*Bahr el-Ghazal.*—The Bahr el-Ghazal is navigated throughout the year by the government postal steamers up to Meshra el-Rek (748 miles from Khartoum). The steamers, carrying passengers and cargo, leave Khartoum once a month and complete the journey in 10 days, the return journey taking 7 days. Steamer communication (tugs towing barges) with Wau on the Jur, a tributary of the Bahr el-Ghazal, is possible from the end of July to November. The last steamer, however, leaves Wau about the middle of September on account of the risk of being cut off by sudd in the Bahr el-Ghazal. Wau is 898 miles by river from Khartoum.

*Shipping and Boats.*—The Sudan steamers have, since the beginning of 1918, been controlled by the Government Railways Department, which supplies shipping and crews as required by the different departments. The steamers have accommodation only for their own fuel and stores, cargo being carried in barges. Certain launches are detailed for postal and sanitary service. The department also owns a number of *gyassas*, *nuggers* and *dahabeahs* and houseboats.

The following places are bases for gunboats and steamers : Mongalla, Kodok, Akobo (Pibor), El-Dueim, Singa, Roseires, Wau, Gambeila, Wad Medani, and Berber.

On the north side of the river at Khartoum are the government dockyards, where there are facilities for the repair and reconstruction of steamers, sailing vessels, and barges operating south of Khartoum.

The following is a list, probably incomplete, of steamers owned by the government.

In addition to the steamer traffic on the rivers there is a large traffic by means of native sailing boats along the different waterways in the Sudan, much of which eventually finds its way to the railways. These boats are frequently able to ascend the rivers when ordinary steamship traffic is suspended.

In addition to the given steamers, there are the following barges : 57 troop and animal barges, with a carrying capacity of 6,200 men and 3,540 tons of stores ; 27 cargo barges, with a carrying capacity of 1,600 tons. The whole of these barges are estimated to carry 3,070 men, 1,825 horse, and 4,100 tons of stores, subject to variation.

An increase in the number is required, both for carrying passengers, and for cattle and goods transport.

District.	No.	Gross tonnage.	Length.	Beam.	Deck space.	Carrying capacity.*	Towing capacity.†	M. per hour.	H.P.	Name.	Type.
SUDAN	Halfa Reach .	1	400	160	26	6,000	60	—	500	Sudan	Stern-wheel steamer
		1	400	160	26	6,000	60	—	500	Britain	"
		1	350	135	25	7,000	40	—	—	Horus	"
		1	300	120	23	3,750	25	—	—	Semna	"
		1	200	100	22	3,200	25	—	—	Ibis	"
M m		1	200	100	20	2,640	20	—	—	Tanjoi	"
		3	150	80	20	2,640	20	—	—	Ambigol	"
	Dongola Reach	—	—	—	—	—	—	—	—	Toski	"
		1	100	22	1,550	50	—	—	—		
		1	90	20	800	40	—	—	—		
Khartoum and the South .		1	70	17	140	25	—	—	—		
		1	65	17	540	30	—	—	—		
		1	60	75	16	683	25	—	—		
		1	23	53	12	72	10	—	—		
		1	—	145	24	—	60	—	300	Melik	Twin-screw gunboat
		1	—	145	24	—	60	—	300	Sultan	"
		1	—	145	24	—	60	—	300	Sheikh	"
		1	—	120	24	—	50	600	10	Fateh	Stern-wheel gunboat
		1	—	120	24	—	50	600	10	Nasir	"
		1	—	120	24	—	50	600	10	Zafir	"
		1	—	75	16	—	25	160	8	Metemma	"
		1	—	80	18	—	30	280	8	Tamai	"

\* Including fuel.

† Of cargo in barges.

Note.—Except in the case of the 'Sudan' or the 'Britain', the tonnage must not necessarily be considered that of the ship's name opposite it.



<i>District.</i>	<i>No.</i>	<i>Gross tonnage.</i>	<i>Length.</i>	<i>Beam.</i>	<i>Deck space.</i>	<i>Carrying capacity.*</i>	<i>Towing capacity.†</i>	<i>M. per hour.</i>	<i>H.P.</i>	<i>Name.</i>	<i>Type.</i>
Khartoum and the South	1	—	80	18	—	30	280	8	100	Hafr	Stern-wheel gunboat
	1	—	75	16	—	25	160	8	80	Abu Klea	"
	1	—	120	22	—	50	480	9	200	Omdurman	Stern-wheel steamer
	1	—	120	22	—	50	480	9	200	Gedid	"
	1	—	100	20	—	30	280	8	100	Dal	"
	1	—	100	20	—	30	210	8	100	Gordon Pasha	"
	1	—	87	18	—	25	150	7	80	Lord Cromer	"
	1	—	95	20	—	30	280	8	100	Amara	"
	1	—	95	20	—	30	280	8	100	Kaibar	"
	1	—	80	20	—	30	280	8	100	Hannek	"
	1	—	100	22	—	80	200	7	100	Atbara	"
	1	—	100	22	—	80	200	7	100	Kereri	"
	1	—	70	16	—	20	150	7	60	Beatrice	"
	1	—	70	16	—	20	150	7	60	Margaret	"
	1	—	60	10	—	15	70	6	25	Shabluka	"
	1	—	65	16	—	20	70	7	50	Louise	"
	1	—	50	8	—	15	70	6	20	Warana	"
	1	—	60	12	—	15	70	7	40	Culex	"
	1	—	65	10	—	15	70	7	25	Eland	"
	1	—	120	24	—	50	—	7	200	Evelyn	Paddle-wheel steamer
"	1	—	100	20	—	50	280	7	100	Sultan Hussein	"
	1	—	100	22	—	50	480	10	200	Cairo	"
	1	—	—	—	—	12	—	8	75	Elfin	"
	1	—	42	8	—	—	—	—	—	Pibor	Steam launch
	1	—	45	9	—	—	—	—	—	Belle	"
	1	—	35	6	—	—	—	—	—	Ena	"

† Of cargo in barges.

\* Including fuel.

District.	No.	Gross tonnage.	Length.	Burn.	Deck space.	Carrying capacity.*	Towing capacity.†	M. per hour.	H.P.	Name.	Type.
Khartoum and the South.	1	—	Ft.	Ft.	Sq. ft.	Tons.	Tons.			Nubia	Steam launch
	1	—	41	7	—	—	—	—	—	Arab	"
	1	—	40	8	—	—	—	—	—	Queen	"
	1	—	35	7	—	—	—	—	—	Alert	"
	1	—	44	8	—	—	—	—	—	Swallow	"
	1	—	48	9	—	20	20	—	—	Heron	"
	1	—	48	9	—	20	20	—	—	Katherine	"
	1	—	40	7	—	12	12	—	—	Swift	"
	1	—	30	6	—	8	8	—	—	Gazelle	"
	1	—	35	9	—	12	12	—	—	Pilot	"
	1	—	35	9	—	12	12	—	—	Morsitans	"
	1	—	—	—	—	—	—	—	—	The Ohm	{ Postal service
	1	—	—	—	—	—	—	—	—	The Volt	
	1	—	—	—	—	—	—	—	—	The Ampere	
	1	—	—	—	—	—	—	—	—	Leopard	Steam tug
	1	—	80	16	—	25	480	11	250	Lynx	"
	1	—	80	16	—	25	480	11	250	Panther	"
	1	—	80	16	—	25	480	11	250	Puma	"
	1	—	52	12	—	12	240	9	80	Viper	"
	1	—	55	13	—	12	240	9	80	Vulcan	"
	1	—	60	10	—	12	200	9	80	Rahad	"
	1	—	60	10	—	12	200	9	80	Dinder	"
	1	—	50	10	—	10	80	8	60	Serpent	"
	1	—	52	11	—	10	80	8	60	Trusty	"
	1	—	60	9	—	10	80	8	60	Zambesi	"
	1	—	60	9	—	10	80	8	60	Nyanza	"
	1	—	60	9	—	10	80	8	60	Congo	"
	1	—	60	9	—	10	80	8	60	Uganda	"

† Of cargo in barges.

\* Including fuel.

<i>District.</i>	<i>No.</i>	<i>Gross tonnage.</i>	<i>Length.</i>	<i>Beam.</i>	<i>Deck space.</i>	<i>Carrying capacity.*</i>	<i>Towing capacity.†</i>	<i>Speed.</i>	<i>H.P.</i>	<i>Name.</i>	<i>Type.</i>
Khartoum and the South	1	—	80	18	—	30	280	8	100	Hafir	Stern-wheel gunboat
	1	—	75	16	—	25	160	8	80	Abu Klea	"
	1	—	120	22	—	50	480	9	200	Omdurman	Stern-wheel steamer
	1	—	120	22	—	50	480	9	200	Gedid	"
	1	—	100	20	—	30	280	8	100	Dal	"
	1	—	100	20	—	30	210	8	100	Gordon Pasha	"
	1	—	87	18	—	25	150	7	80	Lord Cromer	"
	1	—	95	20	—	30	280	8	100	Amara	"
	1	—	95	20	—	30	280	8	100	Kaibar	"
	1	—	80	20	—	30	280	8	100	Hannek	"
	1	—	100	22	—	80	200	7	100	Atbara	"
	1	—	100	22	—	80	200	7	100	Kereri	"
	1	—	70	16	—	20	150	7	60	Beatrice	"
	1	—	70	16	—	20	150	7	60	Margaret	"
	1	—	60	10	—	15	70	6	25	Shabluka	"
	1	—	65	16	—	20	70	7	50	Louise	"
	1	—	50	8	—	15	70	6	20	Warana	"
	1	—	60	12	—	15	70	7	40	Culex	"
	1	—	65	10	—	15	70	7	25	Eland	"
	1	—	120	24	—	50	—	7	200	Evelyn	Paddle-wheel steamer
	1	—	100	20	—	50	280	7	100	Sultan Hussein	"
	1	—	100	22	—	50	480	10	200	Cairo	"
	1	—	—	—	—	12	—	8	75	Elfin	"
	1	—	42	8	—	—	—	—	—	Pibor	Steam launch
	1	—	45	9	—	—	—	—	—	Belle	"
	1	—	35	6	—	—	—	—	—	Ena	"

† Of cargo in barges.

\* Including fuel.

District.	No.	Gross tonnage.	Length.	Beam.	Deck space.	Carrying capacity.*	Towing capacity.†	Speed. M. per hour.	H.P.	Name.	Type.
Khartoum and the South.	1	—	Ft.	Ft.	Sq. ft.	Tons.	Tons.		—	Nubia	Steam launch
	1	—	41	7	—	—	—	—	—	Arab	"
	1	—	40	8	—	—	—	—	—	Queen	"
	1	—	35	7	—	—	—	—	—	Alert	"
	1	—	44	8	—	—	—	—	—	Swallow	"
	1	—	48	9	—	20	20	—	—	Heron	"
	1	—	48	9	—	20	20	—	—	Katherine	"
	1	—	40	7	—	—	12	—	—	Swift	"
	1	—	30	6	—	—	8	—	—	Gazelle	"
	1	—	35	9	—	—	12	—	—	Pilot	"
	1	—	35	9	—	—	12	—	—	Morsitans	"
	1	—	—	—	—	—	—	—	—	The Ohm	{ Postal service
	1	—	—	—	—	—	—	—	—	The Volt	
	1	—	—	—	—	—	—	—	—	The Ampere	
	1	—	—	—	—	—	—	—	—	Leopard	Steam tug
	1	—	80	16	—	25	480	11	250	Lynx	"
	1	—	80	16	—	25	480	11	250	Panther	"
	1	—	80	16	—	25	480	11	250	Puma	"
	1	—	52	12	—	12	240	9	80	Viper	"
	1	—	55	13	—	12	240	9	80	Vulcan	"
	1	—	60	10	—	12	200	9	80	Rahad	"
	1	—	60	10	—	12	200	9	80	Dinder	"
	1	—	50	10	—	10	80	8	60	Serpent	"
	1	—	52	11	—	10	80	8	60	Trusty	"
	1	—	60	9	—	10	80	8	60	Zambesi	"
	1	—	60	9	—	10	80	8	60	Nyanza	"
	1	—	60	9	—	10	80	8	60	Congo	"
	1	—	60	9	—	10	80	8	60	Uganda	"

† Of cargo in barges.

\* Including fuel.

## TABLE OF DISTANCES BY RIVER

*Main Stream*

	<i>From Khartoum.</i>	<i>Intermediate.</i>
	Miles.	Miles.
Cairo . . . . .	1,750	—
Halfa . . . . .	949	801
Kisha . . . . .	834	115
Delgo . . . . .	758	76
Kerma . . . . .	703	55
Dongola . . . . .	669	34
Debba . . . . .	578	91
Kosti . . . . .	532	46
Merowe . . . . .	501	31
Karima . . . . .	496	5
Abu Hamed . . . . .	352	144
Berber . . . . .	224	128
Atbara River . . . . .	200	24
Shendi . . . . .	117	83
Geili . . . . .	29	88
Khartoum . . . . .	—	28
Jebel Auli . . . . .	31	31
El Geteina . . . . .	60	29
Shabasha . . . . .	117	57
El Dueim . . . . .	130	13
Kawa . . . . .	151	21
Debeikir Island . . . . .	163	12
Fachi Shoya . . . . .	181	18
Goz Abu Guma . . . . .	198	17
Kosti . . . . .	199	1
White Nile Bridge (Rabak) . . . . .	203	4
Hillet Abbas . . . . .	206	3
Abu Zeid . . . . .	215	9
Jebelein . . . . .	246	31
Renk . . . . .	305	59
Gusoor el-Galhak . . . . .	359	54
Jebel Ahmed Agha . . . . .	364	5
Meshra el-Zeraf . . . . .	379	15
Kaka (trading port) . . . . .	408	29
Melut . . . . .	424	16
Kodok . . . . .	469	45
Lul . . . . .	487	18
Malakal . . . . .	511	24
Taufikia . . . . .	520	9
Sobat River . . . . .	525	5
Khor Attar . . . . .	535	10
Zeraf Mouth . . . . .	554	19
Tonga . . . . .	563	9
Lake No . . . . .	603	40
Shambe . . . . .	853	250
Kenissa . . . . .	906	53
Bor . . . . .	973	67

# TABLE OF DISTANCES BY RIVER • 533

	<i>From Khartoun.</i>	<i>Intermediate.</i>
	Miles.	Miles.
Gigging } . . . . .	1,016	43
Gemeiza } . . . . .		
Kiro . . . . .	1,042	26
Mongalla . . . . .	1,055	13
Lado . . . . .	1,068	13
Gendokoro . . . . .	1,077	9
Rejaf . . . . .	1,096	12

## *Sobat*

American Mission (Doleib Hill) . . . . .	531	0
Abwong . . . . .	599	68
Nasser . . . . .	708	109
Tawfoot . . . . .	718	10
Pibor Mouth . . . . .	738	20
Adura Mouth . . . . .	753	15
Itang . . . . .	832	79
Gambeila . . . . .	862	30

## *Pibor River*

Pibor Mouth . . . . .	738	0
Akobo . . . . .	804	66
Agwei Mouth . . . . .	826	22
Pibor Post (Fort Bruce) . . . . .	920	94

## *Bahr el-Ghazal*

Ghabat el-Arab . . . . .	700	0
Jur River Mouth . . . . .	726	26
Meshra el-Rek . . . . .	748	22
Wau . . . . .	898	172

from Jur River.

## *Blue Nile*

Khartoum . . . . .	—	—
Eilafur . . . . .	20	20
Masid . . . . .	42	22
Kamlin . . . . .	65	23
Branko . . . . .	70	5
Helalia . . . . .	75	10
Hassaheissa . . . . .	93	18
Rufaa . . . . .	98	5
Fadassi . . . . .	113	15
Abu Haraz . . . . .	121	8
Wad Medani . . . . .	127	6
Dinder Mouth . . . . .	164	37
Wad Abbas . . . . .	200	36
Sennar . . . . .	223	23
Hillet Sheikh Talha . . . . .	238	15
Shellal Abdin . . . . .	248	10
Singa . . . . .	281	33

	<i>From Khartoum.</i> Miles.	<i>Intermediate.</i> Miles.
Karkoj . . . . .	302	21
Barankwa . . . . .	323	21
Abu Nauma . . . . .	325	2
Bunzoga . . . . .	345	20
Bados . . . . .	380	35
Roseires . . . . .	402	22
Lake Tsana . . . . .	1,007	605

### RAILWAYS

The railways in the Anglo-Egyptian Sudan consist of the Sudan Government Railways and a small private line serving the Um Nabardi gold mine. The former consist of two trunk lines connecting the Sudan in the one case with Egypt and in the other with the Red Sea. These two lines run from Khartoum northwards to Halfa (930 km., 578 m.) and eastwards from Atbara, a junction on the Khartoum—Halfa line, to Port Sudan and Suakin (477.5 km., 296.6 m., and 492 km., 305.6 m., respectively). There are in addition a southern extension from Khartoum, through Sennar and Kosti, to El-Obeid (688 km., 428 m.), and a western branch line from Station No. 10, a junction on the Khartoum—Halfa line, to Kareima (222 km., 138 m.). A branch line was constructed from Sennar to Makwar in 1914 in connexion with the Makwar Dam.

The total length of the Sudan Government Railways, exclusive of sidings, is 2,397 km. (1,489 m.).

The Um Nabardi line is a narrow-gauge (2 ft.) railway running to the gold-field at Um Nabadi, some 34 m. from the Sudan Government Railway, the property of the Sudan Gold Field Company (Registered 1908). This line diverges NNE. from Station No. 6 on the Halfa—Abu Hamed line and is about 50 m. in length. The water-supply is obtained from a well, 228 ft. deep, sunk at Mutfa, and from the mine itself (5,000 gallons daily). Mufta is 16 m. distant from the mine and between it and the main railway.

### Route

*Halfa—El-Obeid.*—Main line starts from Halfa (410 ft. above sea-level at Alexandria) on r. bank of Nile, point of

departure for the steamer service to Shellal (near Aswan), and runs SE. and SSE. across Nubian Desert to Abu Hamed on r. bank of Nile, half-way between the Fourth and Fifth Cataracts. There are ten stations between Halfa and Abu Hamed (1,131 ft., 371 km., 230·5 m.). From station No. 6 (203 km., 126 m.) a narrow-gauge line runs NNE. to Um Nabardi, and from station No. 10 (322 km., 212·4 m.) a line runs SSW. to Kareima. At stations No. 4 (124 km., 77 m.) and No. 6 (193 km., 120 m.) wells have been sunk. From Halfa to station No. 5 there is a difference of level of 1,564 ft., and the route is practically uphill all the way. From latter station to Abu Hamed line falls 810 ft., after which there are no very long gradients.

Country traversed between Halfa and Abu Hamed is stony desert almost covered with a heavy dark-coloured sand. On E. rises the bare chain of hills beyond which lies Bir Murat and behind which runs the old caravan route from Korosko to Abu Hamed, 8–10 days' journey. Desert gradually gives place to undulating sand-hills, and at Abu Hamed, at eastern end of the westward bend of the Nile, commences the cultivable belt along the river. From Abu Hamed railway follows r. bank of Nile on the border land between the *atmûr* (steppe) on E. and the cultivated river belt.

Passing through Dəgash (Robatab-Dakhesh) (400 km., 248·5 m.), Abu Dis (430 km., 267 m.), some miles beyond which the Khor Amur is crossed, Shereik (469 km., 291·4 m.), Nadi (485 km., 301·3 m.), Karraba (514 km., 319·4 m.), and Gananita (543 km., 337·3 m.), line reaches Abidia (or El-Abādiyeh) (559 km., 347·3 m.), a station situated above the Fifth Cataract.

At Berber (1,148 ft., 582 km., 361·6 m.), formerly capital of the Province of Berber, commences the old caravan route to Suakin (journey 7–12 days) and the telegraph line to the same point. Line continues through Darmali (605 km., 375·9 m.) to Atbara (1,161 ft., 619 km., 384·5 m.), at junction of Nile and Atbara Rivers and point of departure of line to Port Sudan and Suakin. Crossing the Atbara, which is dry



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from April to June, line continues SSW. and then SW., at varying distances from r. bank of Nile to Khartoum.

From Atbara line approximately follows Nile through level plain and scrub, avoiding rocky country which begins 3 or 4 m. away from river. This section is intersected by numerous watercourses and is subject to washaways. Line passes through El-Damer (633 km., 393.2 m.), important collecting and forwarding station whence there is caravan route to Gos-Rejab (Goz-Regeb) and Kassala, 6 days' journey, Zeidab (652 km., 405.1 m.), Kabushia (722 km., 448.6 m.), near the ruins of Meroe, and Shendi (1,209 ft., 759 km., 471.6 m.), an industrial centre of some importance with considerable forwarding trade, to Wad-ben-Naga (799 km., 496.4 m.). Line again crosses desert, passing through Jebel Jerri (847 km., 526.2 m.) situated in a defile near the Sixth Cataract, to Wad Ramla (883 km., 548.6 m.), whence it runs parallel with Nile across level plain to Halfaya (former station for Khartoum) and then crosses Blue Nile to Khartoum (1,254 ft., 930 km., 577.8 m.).

Continuing across fertile country along l. bank of Blue Nile line runs through Soba (944 km., 586.4 m.) and Wad-Medani (1,348 ft., 1,105 km., 686.5 m.), situated a little above the mouth of the Rahad River, where important experiments in cotton-growing have been undertaken, and a most important collecting and distributing centre, to Sennar (1,397 ft., 1,195 km., 742.4 m.), former capital of the Province of Sennar and connected with Kassala by an organized trade route. From Sennar a branch was constructed in 1914 to Makwar, with sidings at the latter place, in connexion with the Makwar dam. The sidings at the Jebel Moya stone quarry (Moya station) have been largely extended for the same purpose. Line now turns sharply WSW. and crosses country between the Blue Nile and White Nile to Hellet Abbas (1,256 ft., 1,301 km., 808.3 m.) and then crosses White Nile to Kosti (1,256 ft., 1,311 km., 814.5 m.) on l. bank of White Nile whence steamers run down White Nile to Khartoum and up the river to Gondokoro and Rejaf. The region traversed

beyond Sennar is a most fertile district whence large supplies of grain, gum, food-stuffs, and cattle are being exported.

From Kosti line proceeds almost due W. to Rahad (1,633 ft., 1,549 km., 962.4 m.), large village with wells and important forwarding centre, and thence NW. to El-Obeid (1,883 ft., 1,618 km., 1,005.4 m.), capital of Kordofan Province.

*Red Sea—Atbara.*—Starting from Port Sudan line runs SSW., S., and SW. to Atbara on main Sudan railway. From Port Sudan line runs SSW., through Asotriba (10.5 km., 6.5 m.) to Sallom Junction (705 ft., 30.5 km., 18.9 m.), where it is joined by line running NW. from Suakin, through Handub (20 km., 12.4 m. from Suakin and 25 km., 15.5 m. from Port Sudan). Sallom Junction is 45 km. (27.9 m.) from Suakin. From Sallom Junction line ascends along the Khor Okwat, range of volcanic mountains, through a long succession of barren defiles on moderate gradients (1 per cent.), crossing numerous bridges and passing over extensive earthworks, to the highest point at Summit (3,008 ft.), a few miles beyond Sinkat. Line passes through Obo (48.5 km., 30.1 m.), Kamobsana (66.5 km., 41.3 m.), whence it follows the Khor Adit as far as Summit, Erba (89.5 km., 55.6 m.), Gebeit (106.5 km., 66.1 m.), and Sinkat (120.5 km., 74.8 m.), to Summit (132 km., 82.2 m.), with Jebel Naeaira (5,439 ft.), and Jebel Erba (5,152 ft.) on r. and Jebel Hamashauei (3,637 ft.) on l. From Sinkat a route leads to Kassala.

Beyond Summit line descends gradually through the desert along the valleys of the Khor Thamiam, Khor Arab (for about 100 m.), and Khor Hudi, leaving the hills at Musmar, with Jebel Musmar on l. In this section line passes through Barameyu (149.5 km., 92.9 m.), Erheib (170.5 km., 105.9 m.), Thamiam (2,122 ft., 189 km., 117.8 m.), point of departure for proposed railway to Kassala (see p. 541), Einha (218.5 km., 135.7 m.), beyond which the Khor Arab is crossed, Shidieb (243.5 km., 151.3 m.), Talgwareb (1,768 ft., 259.5 km., 161.2 m.), and Musmar (289.5 km., 179.8 m.). At Zehteb (351.5 km., 218.4 m.) the Khor Habob is crossed and line

continues to Hudi (444.5 km., 276.2 m.), running thence almost due W. to Atbara (1,161 ft., 477.5 km., 296.6 m.).

*Abu Hamed—Kareima.*—Line leaves main Sudan railway at Station No. 10 (1,130 ft.) and runs SW. across desert country on r. of Nile to Kareima, whence steamers run to Merowe, Dongola, and Kerma. Owing to hilly nature of ground near Nile the river valley is avoided and is only approached between Keheili (50 km., 31 m.) and El-Kab (718 ft., 70 km., 45.4 m.) and again at Kareima (1,161 ft., 222 km., 137.9 m.).

## STATIONS AND DISTANCES

*Halfa—Khartoum*

<i>Station.</i>	<i>Distance from Khartoum.</i>		<i>Distance from Halfa.</i>		<i>Distance from Port Sudan.</i>	
	Km.	M.	Km.	M.	Km.	M.
Halfa . . . . .	930	578	0	0	1,096	681
Halfa-Camp . . . . .	—	—	—	—	—	—
No. 6 Station . . . . .	727	452	203	126	893	555
Abu Hamed . . . . .	559	347	371	230	725	450
Dagash . . . . .	530	329	400	248	706	439
Abu Dis . . . . .	500	310	430	267	666	414
Shireik . . . . .	461	286	469	291	627	390
Nadi . . . . .	445	276	485	301	611	380
Karraba . . . . .	416	258	514	319	582	362
Gananita . . . . .	387	240	543	337	553	343
Abidia . . . . .	371	230	559	347	537	334
Berber . . . . .	348	216	582	362	514	319
Darmali . . . . .	325	202	605	376	491	305
Atbara . . . . .	311	193	619	385	477	296
El-Damer . . . . .	297	184	633	393	491	305
Zeidab . . . . .	278	173	652	405	510	317
Aliab . . . . .	260	162	670	416	528	328
Mutmir . . . . .	238	148	692	430	550	342
Um Ali . . . . .	227	141	703	437	561	349
Kabushia . . . . .	208	129	722	449	590	367
Taragma . . . . .	188	117	742	461	600	373
Shendi . . . . .	171	106	759	472	617	383
El-Goz . . . . .	152	94	778	483	636	395
Wad-ben-Naga . . . . .	131	81	809	503	657	408
El-Meiga . . . . .	107	66	823	511	681	423
Jebel Jerri . . . . .	83	52	847	526	705	438
Royan . . . . .	63	39	867	539	725	450
Geili . . . . .	47	29	883	549	741	460
Gubba . . . . .	34	21	896	557	754	468
Kadaru . . . . .	18	11	912	567	770	478
Khartoum North . . . . .	4	2	926	575	784	487
Khartoum . . . . .	0	0	930	578	788	490

*Khartoum—El-Obeid*

<i>Station.</i>	<i>Distance from Khartoum.</i>		<i>Distance from Halfa.</i>		<i>Distance from Port Sudan.</i>	
	<i>Km.</i>	<i>M.</i>	<i>Km.</i>	<i>M.</i>	<i>Km.</i>	<i>M.</i>
Khartoum . . . . .	0	0	930	578	788	490
Soba . . . . .	14	9	944	587	802	498
Bageir . . . . .	37	23	967	601	825	513
Masid . . . . .	57	35	987	613	845	525
Turabi . . . . .	81	50	1,011	628	869	540
Maleig Road . . . . .	86	53	1,016	631	874	543
Abu Ushar . . . . .	105	65	1,035	643	893	555
Hassa Heissa . . . . .	129	80	1,059	658	917	570
Mesellemia . . . . .	148	92	1,078	670	936	582
Tayiba . . . . .	161	101	1,091	678	949	590
Wad-Medani . . . . .	175	109	1,105	687	963	598
Barakat . . . . .	—	—	—	—	—	—
Wad-el-Nau . . . . .	196	122	1,126	700	984	611
Hag Abdulla . . . . .	225	139	1,155	718	1,013	629
Wad-el-Haddad . . . . .	241	151	1,171	728	1,029	639
Sennar . . . . .	265	168	1,195	742	1,053	654
Jebel Moya . . . . .	294	183	1,224	761	1,082	672
Jebel Dud . . . . .	319	199	1,249	776	1,107	688
Jebel Biut . . . . .	345	215	1,275	792	1,133	704
Hillet (or Hellet)						
Abbas . . . . .	371	231	1,301	808	1,159	720
Kosti . . . . .	381	237	1,311	814	1,169	726
Wasiyeh . . . . .	404	252	1,334	829	1,192	747
Um Koeika . . . . .	430	267	1,360	845	1,218	757
Selima . . . . .	455	283	1,385	861	1,243	772
Tendelti . . . . .	474	295	1,404	872	1,262	784
Wad-Ashana . . . . .	498	310	1,428	887	1,286	799
El-Ghabsha . . . . .	522	325	1,452	902	1,310	814
Um Ruaba . . . . .	546	340	1,476	917	1,334	829
Abu Hamra . . . . .	569	354	1,499	938	1,357	843
Semeika . . . . .	595	370	1,525	948	1,383	859
Rahad . . . . .	619	385	1,549	962	1,407	874
Nawa . . . . .	640	398	1,570	976	1,428	887
El-Ein . . . . .	663	412	1,593	990	1,451	902
El-Obeid . . . . .	688	428	1,618	1,005	1,476	917

*Port Sudan—Atbara*

<i>Station.</i>	<i>Distance from Khartoum.</i>		<i>Distance from Halfa.</i>		<i>Distance from Port Sudan.</i>	
	<i>Km.</i>	<i>M.</i>	<i>M.</i>	<i>M.</i>	<i>Km.</i>	<i>M.</i>
Port Sudan . . .	788	490	1,096	681	0	0
Asotriba . . .	778	483	1,086	675	10	6
Sallom Junction . . .	758	471	1,066	662	30	19
Obo . . .	740	460	1,048	651	48	30
Kamohsana . . .	722	449	1,030	640	66	41
Erba . . .	699	434	1,007	626	89	55
Gebeit . . .	682	424	990	615	106	66
Sinkat . . .	668	415	976	606	120	75
Summit . . .	658	408	966	600	130	81
Baramayu . . .	639	397	947	588	149	93
Erheib . . .	618	384	926	575	170	106
Thamiam . . .	599	372	907	564	189	117
Einha . . .	570	354	888	552	218	135
Shidieb . . .	545	339	853	530	243	151
Talgwareb . . .	529	329	837	520	259	161
Musmar . . .	499	310	807	501	289	180
Rogel . . .	474	294	782	486	314	195
Togni . . .	452	281	760	472	336	209
Zehdeb . . .	431	268	739	459	357	222
Ogrein . . .	411	255	719	447	377	234
Hadika . . .	388	241	696	432	400	248
Dogala . . .	366	227	674	419	422	262
Hudi . . .	344	214	652	405	444	276
Zulot . . .	327	203	635	395	461	286
Atbara . . .	311	193	619	385	477	296

*Abu Hamed—Kareima*

	<i>Km.</i>	<i>M.</i>	<i>Km.</i>	<i>M.</i>	<i>Km.</i>	<i>M.</i>
Abu Hamred . . .	559	347	371	230	725	450
Station No. 10 . . .	588	365	342	212	754	468
Mehaiza . . .	610	379	364	226	776	482
Keheili . . .	638	396	392	244	804	500
El-Kab . . .	658	408	412	256	824	512
Dakfili . . .	682	424	436	271	838	521
Abu Gharban . . .	706	439	460	286	872	542
Abu Haraz . . .	733	455	487	302	899	559
Amraho . . .	758	471	512	318	924	574
Kassingar . . .	784	487	538	334	950	590
Kareima . . .	810	503	564	350	976	608

*Port Sudan—Suakin*

	<i>Km.</i>	<i>M.</i>	<i>Km.</i>	<i>M.</i>	<i>Km.</i>	<i>M.</i>
Port Sudan . . .	788	490	1,096	681	0	0
Asotriba . . .	778	483	1,086	675	10	6
Sallom Junction . . .	758	471	1,066	662	30	19
Randub . . .	783	486	1,091	678	45	28
Suakin . . .	803	499	1,111	690	63	40

*Projected Lines*

At the present time four projected lines are under consideration. The first of these is the suggested railway from Thamiam, a station on the Nile—Red Sea line, to Kassala, with a further extension, via Gedaref, to Sennar. The first portion has been surveyed in detail and estimates have been prepared, but further action was postponed on the outbreak of war.

An alternative route has been suggested. Some 50 m. S. of Suakin the Baraka River debouches from the Eritrean mountains on to the coastal plain and floods a delta of its own construction. The volume of water is stated to be little inferior to that of the Gash, and the Baraka delta, in which Tokar and El-Teb are situated, contains about 50,000 acres of cultivated cotton lands. The merchants of Tokar have petitioned for railway facilities, and it has been suggested that, in order to meet their requirements, the line from Kassala should follow the eastern, instead of the western, side of the Gash and thence run to Tokar and so on to Suakin. Here the question of port accommodation as between Suakin and Port Sudan is of importance and may possibly form the principal factor in the ultimate decision. In any case the building of a line from Suakin, or a point on that line, to Tokar is likely to be undertaken in the near future, and, if undertaken, would render the construction of a railway from Kassala to Tokar, instead of from Kassala to Thamiam, an unnecessary deviation from the original plan.

Over the total length of 350 km. (219 m.) between Thamiam and Kassala it is proposed to erect some 80 bridges, the majority of which would be small structures of about 10 ft. span. But important bridges would be necessary at km. 102 (63 m.), consisting of 3 spans of 105 ft. each, at kms. 136 and 137 (84.5 m. and 85 m.), consisting of 3 spans of 105 ft. each, one of 50 ft. and one of 20 ft., and at km. 120.5 (75 m.) where there would be a bridge of 2 spans of 105 ft. each and one span of 50 ft. In addition at km. 148.5 (92 m.) there would be



a bridge of 2 spans of 105 ft. The total openings in 219 m. would be some 3,490 ft. of bridging, or about 16.4 ft. per mile.

The second line under consideration is from Sennar to Kassala. This would involve the bridging of the Blue Nile and the Atbara, as well as considerable rivers such as the Dinder, Rahad, and Gash. The proposed railway would run through Mafaza and Gedaref, both important centres of population and cultivation, and almost certainly through Singa, the capital of the Sennar Province. It would provide a direct outlet for the products of the Gezira and Kordofan and, as explained above, would be of considerable strategic value. The distance to the Red Sea from El-Obeid, via Kassala, would be some 70 m. less than by the present route through Khartoum.

The third projected line, an extension from El-Obeid to El-Fasher in Darfur is held up owing to the physical difficulties of the country which, being broken and undulating, would require extensive engineering undertakings. Heavy grading and considerable curving would be necessary. It can hardly be doubted, however, that this line will eventually be undertaken in view of its strategic and commercial value. From the former point of view it would be of great value in the event of railway extension to Western Africa by providing the means of a through route from the Atlantic to the Red Sea. Moreover, as shown below, it would serve as the first section of any railway that may eventually be constructed southwards along the Nile—Congo watershed.

It should be noted that two routes have been considered in connexion with an extension to El-Fasher. Along the northern route there is a lack of water and the country is mainly unproductive. Along the southern route considerable districts are flooded during the rains. The southern route would probably pass through El-Nahud, an important commercial centre, and in the event of its adoption the line would probably branch from the El-Obeid railway at Rahad, and not at El-Obeid itself. In either case the physical difficulties are sufficient to render it desirable, apart from other reasons,

that the Kassala extension should be constructed before the Sudan railways are extended into Darfur.

The fourth line between Suakin and Tokar has been mentioned above.

### *Water-Supply*

The supply of water is of great importance, especially on the El-Obeid line, the Halfa—Atbara section, and on the Nile—Red Sea line. In the case of the El-Obeid line it was at first necessary to transport water-tanks from the base to the terminus, but in 1912–13 wells were sunk at Tendelti, Rahad, and El-Obeid. At Tendelti water is found at a depth of 300 ft. At Rahad the supply is some 20,000 gallons a day, and at El-Obeid it is 4,000 gallons.

The use of condensed water at Port Sudan and on the track to Sallom and Suakin proved costly and the difficulty has been met to some extent by opening wells at Khor Mogg some 3 m. from Port Sudan, in 1913–14. It was considered that with the opening of these wells the use of the condensers at Port Sudan, which have a maximum output of some 300 tons of water per day, might cease, but in 1916 the Khor Mogg wells gave a much reduced yield and more condensed water had to be used. The following is the distribution of the water in this section during 1913–14 :

	1913.	1914.
	<i>Per cent.</i>	<i>Per cent.</i>
Locomotive boilers . . .	60	56
Condenser boilers . . .	6	3
General locomotive use . . .	6	8
Other departments . . .	16	23
On repayment . . .	12	9
Harbour craft . . .	—	1

Since then the condensers have performed heavy duty and have produced a greatly increased quantity of water.

On the Halfa—Abu Hamed section there are wells at Station No. 4 and Station No. 6.

The total number of water installations (1916) is 39, consisting of 3 sets of condensers, 54 pumps, and 43 boilers. The total cost of the water-supply amounted in 1915 to £E10,602 and in 1913 to £E15,378, and the cost of working the condensers was £E8,695 and £E4,930 respectively. The total production of condensed water was as follows : 1913, 14,356,000 gallons ; 1914, 8,545,472 gallons ; 1915, 9,443,691 gallons. The cost of working the condensers, serving only about 50 km. of track, has been more than the cost of the water-supply for the whole of the rest of the railway.

### *Stations*

With the continuation of the line S. of Khartoum a central station was built in that city and was opened on November 1, 1910. At the same time a new station was built at Khartoum North. At the Central Station there is an extensive goods shed. A goods station, with warehouses, has been erected at Mogren Quays, where the gum, sesame, and other trade formerly carried on at Khartoum North has now been transferred. Here transfer of goods to boats is made by steam crane.

### *Workshops*

The main shops of the locomotive and engineering departments are at Atbara. The general details are as follows :

#### *1. Locomotive, carriage, and wagon workshops.*

*Erecting shop* : 150 ft. by 105 ft. Largest lathe 6 ft. 6 in., diameter of face 7 ft. between centres. Horse power of shop engines, 20 N.H.P.

*Carpenters' shop* : 320 ft. by 60 ft. One 12-cwt. steam hammer and one 6-cwt. steam hammer.

*Coppersmiths' shop* : 60 ft. by 105 ft.

*Carriage and wagon shop* : 470 ft. by 120 ft. Two 10-ton electric overhead travelling cranes. One 6-cwt. steam hammer. No. of roads 5. Horse power of shop engines, 20 N.H.P.

*Foundry* : 110 ft. by 105 ft. Weight of largest casting, 2 tons. Horse power of shop engines, 20 N.H.P.

In these shops the average current taken for electrically

driven machines, in addition to machines driven by shop engines, is 150 to 200 amperes.

2. *Engineering department workshops*: 200 ft. by 120 ft. These are fitted with electrically driven wood-working machinery and a few metal-working machines.

3. *Atbara power station*. Contains 2 Robeys Loco Type Boilers—one 25 and one 30 N.H.P.; two 55 K.W. steam dynamos, 220 volts, continuous current; and one Tudar Battery, 1,300 ampere hours at 10 hours rating, with 'Entz' Reversible Booster.

In addition to the Atbara shops repairing dépôts are situated at the following places:

*Halfa*: locomotive running and repair shed; carriage and wagon repair shed; and dockyard for the repair and maintenance of river craft on the Halfa—Shellal reach, equipped with a floating dock 160 ft. by 40 ft.

*Khartoum*: locomotive running and repair shed; carriage and wagon repair shed, and carriage stock shed.

*Port Sudan*: locomotive running and repair shed; carriage and wagon repair and stock shed; and dockyard for the repair and maintenance of harbour craft, and minor repairs to shipping, equipped with a slipway cradle 150 ft. by 40 ft. with a maximum capacity of 500 tons. The Port Sudan Power House, taken over by the railways department on January 1, 1916, supplies electricity for the railways, government departments, and general public. In 1916, 103,448 units were supplied to the railways, 37,843 to government departments, and 32,383 units to the public. In all 310,019 units were generated and 250,367 distributed.

*Kareima*: dockyard for river craft on the Dongola reach.

In addition there are 12 running sheds, situated at No. 6 Station, Abu Hamed, Shendi, Wad-Medani, Sennar, Kosti, Rahad, El-Obeid, Musmar, Gebeit, Suakin, and Kareima.

#### *Permanent way*

*Gauge*.—The gauge is 3 ft. 6 in., similar to that of the South African railways.

*Grades.*—There are no very heavy grades on the Sudan railways, although there are one or two sections where there is a long upward grade involving considerable strain on the engines. From Halfa to Station No. 5 there is a difference of level of 1,564 ft. and thence to Abu Hamed the line falls 810 ft. The features of this section are as follows :

<i>Section.</i>	<i>Length.</i> miles.	<i>Features.</i>
1	17.5	Continuous rise.
1-2	18.6	Many short up-gradients.
2-3	19.2	" "
3-4	21.7	" "
4-5	26	11 m. of level, 15 m. steep and curved.
5-6	23	Continuous descent.
6-7	22.3	Slight down-gradient.
7-8	23.6	Fairly level.
8-9	26	Slight down-gradient.
9-10	13	Irregular, with curves.
10-Abu Hamed	16.7	" "

The ruling grade in the above section is 1.25 per cent. Beyond Abu Hamed it has been reduced to 0.5 per cent. On the Nile—Red Sea line the ruling grade between Port Sudan and Gebeit is 1 per cent. Thence it is 1.25 per cent. On the abandoned Halfa—Kerma line grades were numerous and as stiff as 1.8 per cent. Between Kosti and El-Obeid there is a rise of 626 ft. and between Khartoum and Sennar a rise of 143 ft.

*Curves.*—The maximum curvature is 1,155 ft. radius. On the Desert line to Abu Hamed the usual curve radius is 2,865 ft., but there are curves as sharp as 955 ft.

*Rails.*—A great part of the main line has been relaid with heavier rails than those at first used. The sections relaid are from Abu Dis to Berber, completed early in 1917, from Atbara to Khartoum, and from Atbara to Port Sudan and Suakin. In all 987 km. (613 m.) are laid with 75-lb. rails. Elsewhere 50-lb. rails are used.

The old rails are being accumulated and kept for use on the proposed branch line to Tokar. The section between Halfa and Abu Hamed was reported in 1913 as suffering from age

and to require relaying, ties especially being badly decayed. In connexion with the relaying between Abidia and Shereik a partially new alignment was adopted and certain somewhat heavy gradients eliminated or reduced.

*Ties.*—On the track laid with 75-lb. rails the ties are practically all of Jarrah wood, measuring 7 ft. 6 in. by 9 in. by 5 in. ; but there is a section of 40 km. between Gebeit and Kamobsana on the Red Sea line where steel ties have been used.

On the track laid with 50-lb. rails, the El-Obeid—Khartoum section has 335 km. (208 m.) of steel ties and 332 km. (206 m.) of Jarrah wood ties, measuring 7 ft. 6 in. by 9 in. by 5 in. The rest of the 50-lb. track, with the exception of 7 km. near Atbara, where steel ties are used, is laid with white wood ties, chiefly Baltic pine. All ties used for repairs since 1914 have been creosoted in the Atbara creosoting plant.

The relaying programme was suspended during the war, but extensive tie renewals have been undertaken on the portions of the track that has not yet been relaid between Atbara and Abu Hamed and in the Desert section. Some 20,000 old ties from the Kerma line, in fair condition, but much below the present standard in size and weight, have been used as a temporary measure.

The rails are connected by a pair of fish plates, one flat and one angle, and are fastened to the ties (*a*) in the case of steel ties, by wrought iron keys, (*b*) in the case of wooden ties, directly, by dog spikes, 4 spikes per tie.

*Ballast.*—The railway is ballasted generally with earth, but 180 km. have been ballasted with natural ballast lying alongside the track. The Kareima line is ballasted with sand. The Port Sudan line is ballasted in parts with stone and elsewhere with sand.

*Signals.*—Complete signalling apparatus has been installed at many wayside stations, and it was hoped in 1913 that all main line stations would be similarly provided in the near future.

*Embankments and Cuttings.*—There are a number of embankments on the Nile—Red Sea line, on the Sennar—El-

Obeid section, and on portions of the railway subject to washaways. The chief cutting is at Kamobsana. This extends for half a mile and the maximum depth is 25 ft.

### *Engineering* •

The principal bridges are those over the Atbara River, S. of Atbara, over the Blue Nile at Khartoum, and over the White Nile at Goz Abu Guma, a little S. of, and on the opposite bank to, Kosti.

*Atbara bridge.*—The Atbara bridge was originally a temporary wooden structure, and was replaced by a permanent steel bridge opened to traffic on August 26, 1899. The permanent bridge was erected by the Pencoyd Company, of Philadelphia, in a remarkably short space of time, and after British firms had been unable to supply satisfactory quotations as to time. It consisted of 7 spans of steel, each 147 ft. long, resting on cast-iron cylinders. This bridge was reconstructed in 1910–11 by the Cleveland Bridge and Engineering Company, of Darlington. It is 1,052 ft. long between the end piers, and consists of 7 spans, of 147 ft. each. The old cross girders and stringers were used in the new structure, but the main girders have been renewed. The reconstruction was rendered necessary by the fact that the former bridge was being subjected to greater rolling loads than those for which it was designed. The work was begun in December 1910 and the new bridge was completed by May 31, 1911, in time for use before the flood season on the Atbara. The bridge crosses the river one m. S. of Atbara Junction.

*Khartoum bridge.*—The Blue Nile bridge at Khartoum was opened for traffic in February 1910. A temporary bridge was erected. During the construction of the permanent bridge much of the temporary staging was carried away by flood. The work was executed by the Cleveland Engineering Company. The total length of the bridge is 1,980 ft., including approaches. Starting from the N. bank there is first a 40-ft. approach span, followed by a 60-ft. span supporting the rolling-lift span which gives a clear waterway of 110 ft. This leads

to the seven main spans of 218 ft. 6 in. each. On the S. bank there is one 85-ft. approach span. The length of bridge between the two end piers is 1,835 ft. Girders are of bow-string type. There are about 535 tons of steel in each span, which, complete with flooring and track, weighs about 800 tons.

The lift span has a curved tail-piece, above which is a large steel box, filled with concrete, which acts as a counter-weight to the front portion of the span. It is supported on very deep girders, called track girders, upon which it rolls. At N. end of track girders are two towers and between the towers is a platform supporting the lifting machinery of the bridge. The weight of the moving parts, together with the concrete weight, is some 1,000 tons.

All spans are supported on piers, each consisting of 2 steel cylinders filled with concrete and sunk to depths as great as 83 ft. below water level. Cylinders are 11 ft. in diameter at top and 16 ft. at bottom. The bridge has been designed to provide for the contingency of a second track.

*White Nile bridge.*—The bridge over the White Nile at Goz Abu Guma, between Hellet Abbas and Kosti, is 1,500 ft. long and was constructed by the Cleveland Bridge and Engineering Company. At the point of crossing the river is sluggish both at time of flood and in the dry season. When the river is low the water occupies a channel about 1,500 ft. in width, but in the wet season it spreads across the country for a width of about 3 miles. The line is carried over the part subject to periodical inundation, upon well-built embankments. The over-water structure comprises 9 steel spans, each 146 ft. in length, and one swing-bridge span 245 ft. 6 in. in length. The spans are 6 ft. above high-water level and are supported on masonry piers sunk in steel cylinders, under the agency of compressed air, to a depth varying between 30–50 ft. below low water.

*Other bridges.*—In addition to these three large bridges there is a very large number of culverts and smaller bridges, and also some other more considerable structures. The culverts are rendered requisite owing to the necessity for providing for the escape of water in times of flood. Many parts of the railways



have been subjected to disastrous washaways and great damage has been done. To obviate this danger, so far as is possible, there has been a continuous addition to the number of openings, and each year many additional culverts and small bridges have been provided. The difficulties due to sandstorms (in certain sections) and floods have been enormous. The former occur during the months September–December, and gangs of men are frequently employed in clearing the track of the sand which lies several inches deep, while the N. wind sometimes becomes so strong as to prevent even a powerful engine from proceeding against it.

The usual type of bridge consists of steel plate girders in 50-ft. and 30-ft. lengths, with rails laid on the top booms. The smaller culverts as a rule consisted of 2-ft. cast iron pipes set in masonry, but during recent years larger culverts have generally been provided.

The following is a list of bridges of 105-ft. span between Port Sudan and Suakin and Atbara; and Atbara and Abu Hamed:

(1) *Port Sudan—Atbara.*

<i>Distance from Khartoum.</i>		<i>Head- way.</i>	<i>No. of spans.</i>	<i>Between stations.</i>	<i>Sections.</i>
Km.	Miles.	Feet.			
779-688	484-428	6	9	Port Sudan—Asotriba	Port Sudan—Sallom
765-835	475-875	5	3	Asotriba—Sallom	"
761-778	473-354	5	2	"	"
749-426	465-679	5	1	Sallom—Obo	Sallom—Kamobsana
749-188	465-531	7	1	"	"
748-603	465-168	7	1	"	"
748-390	465-036	7	1	"	"
748-328	464-997	7	1	"	"
745-978	463-737	3	2	"	"
740-841	460-345	5	4	"	"
732-349	455-068	4	2	Obo—Kamobsana	"
724-888	450-387	4	1	"	"
724-520	450-203	5	1	"	"
716-586	445-273	4	6	Kamobsana—Erba	Kamobsana—Gebeit
708-318	440-134	6	3	"	"
707-430	439-584	5	4	"	"
693-599	430-989	6	2	Erba—Gebeit	"
677-175	420-784	6	1 + 1 55 ft. span	Gebeit—Sinkat	Gebeit—Musmar

<i>Distance from Khartoum.</i>		<i>Head- way.</i>	<i>No. of spans.</i>	<i>Between stations.</i>	<i>Sections.</i>
Km.	Miles.	Feet.			
668-992	415-599	2	1	Gebeit—Sinkat	Gebeit—Musmar
619-612	385-015	7	3	Baramayu—Erheib	"
591-214	367-369	5	1	Erheib—Thamiam	"
591-020	367-249	4	1	"	"
557-381	346-345	9	2	Einha—Shidieb	"
554-276	344-417	16	1+1 55 ft. span	"	"
542-307	336-980	11	3	Shidieb—Talgwareb	"
343-603	213-526	6	1	Hudi—Zullot	Musmar—Atbara

(2) *Suakin—Sallom.*

<i>Distance from Suakin.</i>		<i>Head- way.</i>	<i>No. of spans.</i>	<i>Between stations</i>	<i>Section.</i>
Km.	Miles.	Feet.			
30-5	18-95	4	1	Handub—Sallom	Suakin—Sallom
37-3	23-17	4	1	"	"
38-55	23-954	5	1	"	"
38-6	23-98	6	1	"	"
38-7	24-04	5	1	"	"
38-85	24-14	3	3	"	"

(3) *Abu Hamed—Atbara.*

<i>Distance from Khartoum.</i>		<i>Head- way.</i>	<i>No. of spans.</i>	<i>Between stations.</i>	<i>Section.</i>
Km.	Miles.	Feet.			
406	252	6	1	Gananita—Karraba	Abu Hamed—Atbara
422	262	6	1	Karraba—Nadi	
428	266	6	1	"	
431	267	6	1	"	

On the Nile—Red Sea line as originally constructed there were 42 bridges with spans of 110 ft. and 39 with spans of 55 ft., together with 95 15-ft. openings and 160 5-ft. openings crossed by steel girders on small masonry piers.

On the main line there are important bridges between Station No. 9 and Station No. 10; between Abu Dis and Shereik across the Khor Amur; between Karraba and Gananita over the Khor-el-Homar; between Abidia and Berber (two); and between Kabushia and Taragma. On the Nile—Red Sea line there are important bridges between

Shidieb and Einha over the Khor Arab, between Obo and Kamobsana, and between Zehteb and Hadika on the Khor Habob; and on the Kareima line between El-Kab and Keheili, between Dakfili and Abu Gharban, and between Abu Gharban and Abu Haraz.

### *Equipment*

*Locomotives.*—The number of locomotives employed on the Sudan railways is 107 as shown in Table on p. 558. The oldest engines, employed for shunting and local services, were constructed in 1886 and have been rebuilt in the Sudan. The later engines as a rule have been built in Great Britain with the exception of certain engines supplied in 1899 by the Baldwin Locomotive Company in America. Considerable controversy arose as to the employment of American and other foreign makes in Egypt and the Sudan, and in 1900 it was reported that 'the workmanship of the locomotives, with the exception of the working parts, is rough, and far short of the finish desirable by European engineers.' Exhaustive trials were made regarding the merits of the competing engines, and a report on the question was issued in 1902. It was stated that the main reason why orders had gone to America was that they had been completed with extraordinary rapidity accompanied by a considerable difference in price. It was found, however, that American engines consumed greater quantities of coal and water and had a less drawing power when compared with locomotives of British make. Further trials demonstrated that the American engines were more expensive to maintain. Locomotives fitted with steam super-heaters show a marked economy compared with others of the same class without super-heaters, the average consumption of coal per km. during 1913 being 11·8 kilos (41·8 lb. per m.) as against 15·5 kilos per km. (55 lb. per m.) respectively.

At the present time the newest engines are those of the 'Pacific' type, 6-coupled, supplied by the North British Locomotive Company, Glasgow, in 1911, and of the 'Atlantic'

type, 4-coupled, supplied by Messrs. Robert Stephenson and Company, Darlington, in 1910.

The 'Pacific' engines and those of the 'Atlantic' type are used exclusively for passenger traffic. The coal consumed has to be imported as also oil for all purposes.

*Passenger Service.*—The passenger equipment consists of 12 sleeping cars, 3 dining cars, 3 buffet cars, 3 kitchen cars, 6 first class cars, 8 second class cars, 15 first and second class composite cars, 5 second and third class composite cars, 24 third class cars, and 50 fourth class cars—a total of 129 cars with accommodation for 7,073 passengers. The weight varies from 34 tons for the heaviest of the sleeping cars and 30 tons for first class cars to 11 tons for certain of the fourth class cars. Tourist trains are composed of the most modern type of cars and are fitted with electric fans and lights. Certain cars have been converted from flat trucks and others have been built at the Atbara shops, where owing to the installation of electrically-driven machinery and the enlargement of the shops it is now possible to build 60-ft. carriages. Practically all passenger stock built abroad has to be rebuilt in the Sudan owing to shrinkage in the woodwork, and for this reason it is probable that the Atbara shops will be more extensively used in the future, and wood that has been seasoned in the country employed.

*Goods Service.*—The goods wagons consist mainly of double-bogie open steel wagons, of which there are 247 of 30 and 25 tons capacity and 14 and 11 tons tare ; of double-bogie open wooden wagons, of which there are 47 of 10 tons capacity and 10 tons tare ; of double-bogie covered steel wagons, of which there are 214 of 30 and 25 tons capacity and 14 and 12 tons tare ; of double-bogie covered wooden wagons, of which there are 73 of 10 tons capacity and 11 tons tare ; together with a certain number of 4-wheel wagons and cattle-trucks. In all about 740 wagons are available for goods and cattle. For the water-supply 134 tank wagons are available, with a total capacity of some 347,500 gallons.

*Service*

In 1916 the passenger service on the railways was as follows. On Mondays and Fridays a mail train left Khartoum for Haifa, taking 31 hrs., returning on Sundays and Thursdays in 31 hrs. 30 min. Local trains were run between Berber and Atbara on Saturdays and fourth class trains from Abu Hamed to Atbara on Fridays, in 9 hrs. 39 min., and from Atbara to Abu Hamed on Sundays in 9 hrs. 58 min. Slow passenger trains ran from Khartoum to Atbara on Tuesdays, Thursdays, and Saturdays in 11 hrs. 20 min. down and 11 hrs. 30 min. up. From Kareima to Abu Hamed a mail train ran on Tuesdays in 9 hrs. and from Abu Hamed to Kareima on Thursdays in 9 hrs. 52 min.

From Atbara to Port Sudan a mail train ran on Tuesdays and Saturdays in 19 hrs. 55 min., returning on Sundays and Thursdays in 20 hrs. 57 min. Trains ran between Port Sudan and Suakin on Tuesdays and Saturdays, returning on Sundays and Thursdays, in 2 hrs. 55 min. and 3 hrs. 2 min. respectively. From Khartoum to Sennar slow passenger trains ran on Sundays, Tuesdays, Wednesdays, and Saturdays in 9 hrs., and in the opposite direction on Sundays, Mondays, Thursdays, and Fridays in 9 hrs. 30 min. From Sennar to El-Obeid slow passenger trains ran on Sundays and Wednesdays in 19 hrs. 15 min., and in opposite direction on Wednesdays and Saturdays in 22 hrs. 30 min.

The average speed of mail trains between Khartoum and Halfa, including stops, is 30 km. (18.6 m.) per hour, and of passenger trains from Khartoum to Sennar is 29.44 km. (18.29 m.) per hour. From Sennar to El-Obeid the average speed is 21.97 km. (13.65 m.) per hour.

No train is allowed to exceed 25 vehicles in length, exclusive of one locomotive tank for the use of the engine. The following shows the percentage of average loading of goods trains to the maximum load in each section of the line during 1916 :

<i>Section.</i>	<i>Up.</i> Per cent.	<i>Down.</i> Per cent.
Port Sudan—Gebeit . . . .	95	90
Gebeit—Atbara . . . .	96	94
Atbara—Halfa . . . .	82	100
Atbara—Abu Hamed . . . .	71	99
Abu Hamed—Kareima . . . .	92	74
Atbara—Khartoum . . . .	82	100
Kosti—Khartoum . . . .	100	73
El-Obeid—Kosti . . . .	93	78

Compared with previous years the average load of wagons was as follows :

<i>Description of wagon.</i>	<i>1914.</i> Tons.	<i>1915.</i> Tons.	<i>1916.</i> Tons.
30-ton, covered . . . .	18.36	17.61	17.75
25-ton, covered . . . .	14.15	14.83	15.50
30-ton, open . . . .	26.32	24.87	23.97
25-ton, open . . . .	21.46	21.49	21.49
15-ton, covered . . . .	9.37	8.74	8.95
10-ton, open . . . .	6.74	7.77	7.58
10-ton, covered . . . .	6.70	7.44	7.27

The average loading of wagons has not been very satisfactory (1915-16), owing to the unevenness of the traffic, due to an increase in exports without any corresponding increase in imports. Rather than wait for full loads, wagons were returned from Halfa and Port Sudan to Khartoum and stations farther south with light loads to meet the pressing demand for trucks.

Traffic is now so heavy over the whole system that there is nothing to spare in motive power. This means that the rate of wear will become more severe, and, although the increased traffic means increased revenue, it is essential that in order to earn this extra revenue the rolling-stock should be efficiently maintained. The difficulties of the present situation are of a temporary nature. Owing to the necessity of economizing in the consumption of coal strict supervision has been exercised over train mileage and train loads. Passenger accommodation had been provided in 1916 only on mixed trains, the loads of which were completed with goods, while no goods trains were run unless full loads in one direction were available.

During the first four months of the year the pressure of goods traffic is very great and it has become obvious that an increase in rolling-stock, both of engines and goods wagons, is a necessity. The railway is equipped to run normally two trains a day throughout the system ; but during the busy period the wagon capacity is taxed to the utmost and train running is increased by 40 to 50 per cent. The increase of export traffic via Halfa is due to a temporary lack of shipping at Port Sudan.

Certain goods may be booked through to Egypt. In 1915 and 1916 the following were the quantities so handled :

	<i>Parcels and Baggage.</i>				<i>Goods.</i>			
	<i>To Egypt.</i>		<i>From Egypt.</i>		<i>To Egypt.</i>		<i>From Egypt.</i>	
	<i>1915.</i>	<i>1916.</i>	<i>1915.</i>	<i>1916.</i>	<i>1915.</i>	<i>1916.</i>	<i>1915.</i>	<i>1916.</i>
	£E.	£E.	£E.	£E.	£E.	£E.	£E.	£E.
Public . . . . .	197	234	569	271	3,801	20,922	3,509	8,158
Government . . . . .	511	545	660	1,103	202	263	116	601
Totals . . . . .	708	779	1,229	1,374	4,003	21,185	3,625	8,739

#### *• Administration and Finance*

The Sudan railways are the property of the Sudan Government. The head-quarters are at Atbara and for purposes of administration the line is divided into the following departments : general manager, engineering, mechanical, traffic, harbours and lights, and stores.

The local head-quarters are as follows :

Halfa, traffic, locomotives, and steamers.

Abu Hamed, engineering.

Karcima, locomotives and steamers.

Port Sudan, traffic and locomotives.

Gebeit, engineering.

Khartoum, Wad Medani, and Kosti, traffic, locomotives, and engineering.

El-Obeid, traffic.

The highest administrative authority is the general manager who is responsible to the Governor General in Council. There is no railway board.

The Sudan Government Railways in the early days after the re-conquest were known as the Sudan Military Railway. They were, and largely still are, administered by officers of the Royal Engineers, although civilians now hold important administrative posts.

The directing staff of the Sudan Government railways is in general European. Many of the engine drivers are European, and where native Egyptians are employed it is reported that as a class they are irresponsible and have only a superficial knowledge of the machines they handle.

There is a railway cantonment at Atbara in connexion with the engineering and locomotive shops at that place. The following is the approximate number of inhabitants in the cantonment :

<i>Nationality, &amp;c.</i>	<i>Men.</i>	<i>Women.</i>	<i>Children.</i>	<i>Total.</i>	<i>Remarks.</i>
British . . . . .	55	24	12	91	
Detachment of 1st Garrison Batt. Essex Regt. . . . .	50	—	—	50	Including 1 officer.
Egyptian . . . . .	236	180	383	799	
European . . . . .	83	47	59	189	Including merchants.
Railway Battalion . . . . .	592	—	—	592	Including 14 officers.
Detachment of 2nd Batt. . . . .	73	—	—	73	Including 3 officers.
Indian . . . . .	4	1	3	8	Including 1 merchant.
Natives of Sudan . . . . .	230	2	1	237	
Dervishes . . . . .	18	21	20	59	
Total . . . . .	1,355	287	499	2,141	

In connexion with the general work of the railways there are two Railway Battalions under military discipline and control. The men are Egyptian natives. The head-quarters of the battalions are at Atbara, where the 1st Battalion and a detachment of the 2nd Battalion are stationed.

The building and equipment of the railways had cost up to the end of 1916 a sum of £E6,835,727, of which £E5,787,932 had been expended on construction. The average kilometric and mileage cost therefore has been £E2,851 and £E4,592 respectively.

In 1916 the railways showed a net profit of £E287,661 out of a total revenue of £E742,474, the expenses being £E454,813.



TABLES  
LIST OF LOCOMOTIVES

Class.	No.	Type.	Makers.	Weight in working order.			Built.	Remarks.
				Engine. Tons. Cwt.	Tender. Tons. Cwt.	Total. Tons. Cwt.		
A	4	Atlantic 4. 4. 2	Robert Stephenson & Co., Darlington	53 6	51 11	104 17	1910	Passenger service
B	3	4. 4. 0	Kitson & Co., Leeds	31 15	32 15	64 10	1903	"
C	4	4. 4. 0	Baldwin Locomotive Co., America	33 15	27 5	61 0	1899	"
D	15	Pacific 4. 6. 2	North British Locomotive Co., Glasgow	54 1	45 17	99 18	1911	Mixed service. 10 engines with superheater
E	5	2. 6. 0	Kitson & Co., Leeds	38 18	43 4	82 2	1908	Mixed service
F	11	2. 6. 0	Baldwin Locomotive Co., America	41 10	32 2	73 12	1899	"
G	27	4. 6. 0	North British Locomotive Co., Glasgow	49 0	44 12	93 12	1904	Goods service
H	21	4. 6. 0	North British Locomotive Co., Glasgow	53 4	44 16	98 0	1904	"
I	17	0. 6. 0	Rebuilt in Sudan	---	---	28 0	1886	Shunting and local service

## PASSENGER EQUIPMENT

<i>Class.</i>	<i>Type.</i>	<i>No.</i>	<i>Tare.</i>	<i>Capacity.</i>	<i>Total passenger capacity.</i>	<i>Remarks.</i>
Sleeping cars	Double bogie	6	23	10 berths	60	First class only
"	"	4	33	14 "	56	"
"	"	2	34	14 "	28	"
Dining cars	"	3	21	34 seats	102	"
Kitchen cars	"	3	23	Staff	—	
Buffet cars	"	2	31	24 seats and staff	48	First class only
"	"	1	20	18 "	18	"
First class passenger cars	"	5	30	30 seats	150	
"	"	1	24	30 "	30	
Second class passenger cars	"	6	29	48 "	288	
"	"	2	23	48 "	96	
First and second class composite cars	"	8	30	18 firsts and 24 seconds	336	
"	"	5	23	12 "	170	
"	"	2	14	10 "	48	
Second and third class composite cars	"	5	21	15 seconds and 32 thirds	235	
Third class cars	"	10	25	62 seats	620	
"	"	3	23	52 "	156	
"	"	9	20	46 "	414	
"	"	2	13	50 "	100	
Fourth class cars	"	10	17	100 "	1,000	
"	"	10	11	61 "	610	
"	"	8	11	61 "	488	
"	"	22	12	90 "	1,980	
Brake, post, and third class composite cars	"	2	23	7 tons and 20 thirds	40	
Total	"	129			7,073	

## GOODS EQUIPMENT

<i>Class.</i>	<i>Type.</i>	<i>No.</i>	<i>Tare.</i> Tons.	<i>Capacity.</i> Tons.	<i>Total capacity.</i> Tons.	<i>Remarks.</i>
Open steel wagons .	Double bogie	182	14	30	5,460	
" "	"	65	11	25	1,625	
" "	4 wheels	15	6	15	225	
Open wooden wagons	Double bogie	47	10	10	470	
Covered steel wagons .	"	149	14	30	4,470	
" "	"	65	12	25	1,625	
" "	4 wheels	35	6.5	15	525	
Covered wooden wagons	Double bogie	73	11	10	730	
" "	4 wheels	10	8	10	100	Low sides
Open wooden wagons	"	7	4.5	5	35	"
Brake vans .	Double bogie	32	14	30	960	
" "	"	4	12	25	100	
					<hr/>	
					16,925	Total capacity of goods wagons
Cattle wagons	Double bogie	48	14.5	30		
" "	"	10	12.5	20		
" "	"	24	11	10		
" "	4 wheels	5	5.5	10		
Sheep wagons	Double bogie	6	16.5	30		Double decked

MISCELLANEOUS EQUIPMENT

<i>Class.</i>	<i>Type.</i>	<i>No. Tons.</i>	<i>Capacity.</i>	<i>Remarks.</i>
Brake, post, and baggage vans	Double bogie	2 24	12.5 tons	
"	"	4 20	10 "	
Postal sorting vans	"	1 13	7 "	
"	"	3 23	15 "	
"	"	2 11	7 "	
Hospital car	"	1 24	4 firsts and 8 thirds	
Saloon cars	"	1 36	2 firsts and staff	
"	"	1 24	" "	Tourist car
"	"	1 23	" "	Governor-General's car
Boiler trucks	"	2 18	25 tons	Tourist car
Brake and post vans	"	13 12	10 "	
Service inspector cars	"	5 22	" "	Heads of departments inspection saloons
"	"	8 19	" "	Officials' saloons
"	"	8 17	" "	"
"	"	13 13	" "	Senior inspectors' saloons
Inspection saloons	4 wheels	33 9	" "	Junior inspectors' saloons
5,000-gallon tank wagons	Double bogie	32 15	22 tons	Locomotive and stations water-supply
3,000 "	"	23 16	13 "	"
1,500 "	4 wheels	79 6	6.5 "	"
1,500 "	"	9 6	" "	(Water capacity of tank wagons = 347,500 gallons)
Miscellaneous service trucks	Double bogie	5 12	10 "	Liquid fuel
"	"	3 12	" "	Breakdown vans
"	"	3 12	" "	Signal vans
"	"	6 12	" "	Weighbridge vans
"	"	1 12	" "	Pump vans
"	"	1 12	" "	Electric light van
"	"	8 8	" "	Carriage and wagon breakdown truck
"	"	1 12	1 ton	Motor trolley wagons
"	"	1 8	10 tons	Dispensary car
"	"	6 4	5 "	Stores and shop service trucks
"	4 wheels	5 4	" "	"
"	"	"	"	Shunting trucks

SUDAN

0 0

## ROADS AND TRACKS

The somewhat misleading usage of the word 'road' current in describing land communications in the Sudan must always be borne in mind. The word has generally been used to describe main routes, although these may frequently be merely tracks. Indeed, with the exception of one or two recently 'made' roads (see below), the 'roads' in the Sudan are cleared tracks suitable for camel or other animal transport. It has not been considered advisable to alter this usage of the word in what follows.

The roads in the Sudan north of Khartoum subserve local needs, but are generally of small economic importance. The roads from El-Damer to Kassala and from Kassala to Suakin are exceptions. Other communications that may be noted are the tracks between the Korti—Debba district and the Nile at Omdurman and Metemma, and the ancient caravan route from Berber to Suakin. A series of tracks connects up the bend of the Nile in Dongola and Halfa with the Arbain Road and the desert oases. There is a route connecting Abu Hamed and Haleib.

The important land routes of the Sudan are those of its central portion, viz. those going eastward from Wad Medani and Sennar on the Blue Nile towards Eritrea and north-western Abyssinia, and those in the western Sudan linking up places in Kordofan with the railway. The latter join up with route systems extending westward connecting El-Obeid and El-Nahud with El-Fasher via Abiad and El-Odaiya respectively. Still farther west El-Fasher is connected via Kabkabia and Tumtuma with Abesher in Wadai. It is impossible to say how far traffic may be developed along this last route, but there are interesting possibilities, and it is possible that by it the Sudan Government Railways may secure a portion of the traffic from the French Sudan.

A direct route runs from Khartoum. to Kassala. Abu Deleig is an important route centre between the Niles and the Atbara. The road from Wad Medani to Gedaref via El-Fau

forms an important connexion between the Blue Nile and Gedaref, while the latter place is linked up by an important connexion with Mafaza and Gallabat. There are roads from the Blue Nile to the Dinder and the Rahad, and from the upper courses of the Blue Nile and Dinder into Abyssinia. There is a road from Singa via Abu Hashim along the Dinder and the Khor Galega to Dunkur in Abyssinia. From Roseires a road goes to Kurmuk and Kirin (in Abyssinia) via Soda.

Tracks run from Renk on the White to Roseires on the Blue Nile, and farther south from Galhak to Kurmuk. In the Gezira numerous tracks connect the two Niles. West of the White Nile tracks take off at El-Dueim for the northern part of Kordofan. Tracks connect the railway in Kordofan with the Nuba mountains.

The Sobat route via Gambeila tends to attract towards the Nile outlet the trade of that part of south-western Abyssinia which is not tapped by the railway from Addis Abbeba to Jibuti. Trade from north-western Abyssinia and Eritrea enters the eastern Sudan by way of Kassala, Gallabat, Roseires, and Kurmuk. Trade in these regions would be greatly stimulated by the construction of the proposed railway from Kassala to Gedaref, Mafaza, and Sennar, with possible extension to Gallabat.

There is a system of routes of strategic, but small economic, importance which connects a number of military posts in the Bahr el-Ghazal with Wau and with the Nile at Shambe. In the south-eastern Sudan the river system of the Sobat and Pibor district and the tracks in this district form systems of native communication. South of Malakal a track runs north and south along the Bahr el-Zeraf and the telegraph line between Khor Atar on the Upper Nile and Bor on the Bahr el-Jebel. Tracks lead from Amadi in the Moru district of Mongalla to Rejaf and Tombe, and on the east bank from Mongalla to Torit. A series of tracks lead from Kafia Kingi, Deim Zubeir, Tembura, Yambio, Meridi across the frontier into the French and Belgian Congos.

The trade of the French and Belgian Congos tends to follow the west African route, but the route from Aba, in the Belgian Congo, to Libogo on the Sudanese frontier and thence via Yei to Rejaf affords access from the eastern part of the Belgian Congo to the Nile and is being increasingly used. The traffic of the Bahr el-Ghazal tends along the routes seeking the Nile via Wau and Shambe.

It may be noted here that there was a proposal to use the route from Albert Nyanza to Rejaf as an alternative route by which to export coffee to the Sudan, partly to take the place of the route to the European market via Mombasa, when that was not practicable owing to the war.

The road from Talodi to Tonga on the Upper Nile is the main exit from Nuba Mountains to the south.

Inasmuch as they mainly cross desert country, the roads in the northern part of the Sudan are, although less important, better in themselves than those in the centre and south, which often cross grass or swamp land; and it has to be borne in mind that a number of roads in the Bahr el-Ghazal and elsewhere in the south are not practicable either in the rains or at times of extreme drought.

*Made Roads.*—One made road runs from Rejaf to Aba in the Belgian Congo via Libogo. Culverts and bridges have been built on the Rejaf—Loka and Loka—Yei sections. These sections are completed for light motor transport, and the necessary culverts, bridges, &c., are being built for the Yei—Libogo section. The road for the present is suitable for only light mechanical vehicles. The limiting factor is the 100-ft. span bridge over the Yei, which, though designed for heavy lorries, has had to be completed with materials available in the country, and will carry a load of one ton per axle with a minimum wheel base of 6 ft. only.

Another made road runs from Summit station on the Red Sea line to Erkowit Hill station, and is suitable for any class of motor traffic; a diversion has been added connecting it to Sinkat.

No new made roads are at present contemplated. Im-

provement of existing lines of communication is an urgent administrative necessity.

*Motor Traffic.*—As regards the possibility of running motor traffic over the Sudan roads, it must be remembered that while many tracks are practicable for this as *they now are*, in many cases a very little heavy wheeled traffic would totally destroy the surface of the track and make it difficult for wheeled transport. But, keeping this in mind, it may be said that given either a light, and fairly high, powerful car, or tractors of caterpillar or other type capable of getting over khors and occasional bad places, a very large proportion of the main tracks of the Sudan are feasible for motor traffic during the dry-weather season. Practically the whole of the 'cotton soil' areas can, *when dry*, be traversed by motors. During the rains all these areas become impassable for wheeled traffic. On the other hand in northern Kordofan and northern Darfur, where the difficulty is 'Goz' country, i.e. sand-dunes, with rather steep gradients, the rains harden up the sand and make the tracks feasible for a light vehicle which does not break through the hard crust formed for a short period by the rains.

The following is a list of main tracks which have been traversed by motor vehicles for experimental or emergency purposes, with remarks :

Port Sudan—Tokar. Feasible for Ford or similar type of light, high-powered car all the year round.

Atbara—Kassala. Feasible for light mechanical transport during the non-rainy season, i.e. October to June.

Summit and Sinkat Stations—Erkowit. Feasible for fairly heavy motor traffic. Only used during summer.

Khartoum—Kassala. Feasible for cars and light lorries (River Atbara can only at present be crossed at dead low river).

Sennar—Singa. Quite feasible for light cars and lorries during the dry season.

Singa—Roseires. Ford cars have been run experimentally.

Tonga—Telodi. Feasible for cars and vans, and for light lorries during non-rainy season, i.e. October to May.



- Meshra el-Rek—Wau. Feasible for cars, vans, and light lorries during non-rainy season.
- Rahad—Abu Zabbad. Feasible for Ford cars and vans or light cars of similar type all the year.
- Rahad—El-Obeid. Feasible for Ford cars and vans or light cars of similar type all the year.
- El-Obeid—El-Nahud. Quite feasible for light cars and tractors and lorries all the year.
- El-Nahud—El-Fasher via Jebel Hilla and Abiad. Feasible for light cars and lorries in an emergency, but very hard on plant.
- El-Nahud—El-Fasher via El-Odaiya and Wadi el-Ko. Feasible for light cars during dry season, but western portion impossible during rains.
- El-Obeid—Dilling. Quite feasible, has been in use for Fords and Crossley tenders for military purposes.

*Note.*—During the latter portion of the Darfur expedition a bi-weekly service of Ford vans and cars was run from El-Obeid to El-Fasher along the northern route, but the very heavy wear and tear on running plant due to the miles of Goz country to be crossed prohibited the continuation of the service for ordinary administrative and commercial purposes.

#### METHODS OF TRANSPORT

The methods of transport vary in different provinces. The chief factors to be considered are the state of the roads and the susceptibility of the various kinds of animals to diseases prevalent in such provinces.

**Dongola Province.** Camel pack transport is practically the only form of transport used in this province.

It is quite possible, however, that donkey transport would be equally suitable on certain roads where water was within easy reach.

**Khartoum Province.** In Khartoum itself and its immediate vicinity every form of animal and motor transport could be used.

**Darfur and Kordofan Provinces.** Camel pack transport is most generally used, but the natives also make use of bull pack transport.

Donkey pack transport has also been recently utilized between El-Obeid and Dilling with marked success and with exceptionally few casualties, and it is considered that it would prove equally successful between El-Obeid and Darfur when sufficient water is available on the roads.

Bull pack transport has also been successfully used by the army between El-Obeid and Dilling, and proved a useful addition to the transport service.

Motor transport has been utilized on the El-Obeid and Dilling road, also between El-Obeid, El-Nahud, Jebel Hilla, and El-Fasher. When the roads have been cleared there is every reason to believe that its use will be greatly extended in these provinces, and that it will compare so far as cost is concerned very favourably with animal transport.

The types of cars that have been tested are :

Ford touring cars.

Ford vans.

Ford ambulances.

Crossl y cars.

**Sennar, Blue Nile, and Kassala Provinces.** The chief form of transport used in these provinces is camel pack transport.

The camel will carry a load of from 300 to 360 lb. made up into two packages of from 150 to 180 lb.

When on the march with good grazing the normal ration is 8 to 10 lb. of grain and a small ration of salt.

In standing camps this ration is increased to 12 lb. of grain.

Where no grazing is possible the forage ration consists of :

6 lb. grain

5 lb. tibn, i.e. chopped wheat straw.

30 lb. green forage.

Small ration of salt.

Donkey pack transport can also be utilized in these provinces.

On certain roads light motor transport could also be made use of.

Nuba Mountains Province. The transport employed in this province is practically all bull transport.

The presence of biting flies prohibits the general use of camels in the southern portions of this province, but during the dry weather a certain number of camels are used by the natives, but they do not like using their camels as far south as Talodi or on the Tonga road.

The natives chiefly use bulls as pack animals, but for army transport work it has been found more useful to use the bull in draught.

In draught a pair of bullocks will draw a load of 750 lb. Used as pack animals the load is 160 lb. each.

When on the march the forage ration is 8 lb. of grain, in standing camps 6 lb. of grain, 2 lb. of tibun and 20 rotls of green forage, with a small ration of salt are issued.

The bull cart is provided with a pole and yoke for draught by two bullocks; its weight is 575 rotls. These carts are used on the Tonga—Talodi road and between Talodi and Kadugli.

Bull wagons drawn by 12 bulls are also in use on the Tonga—Talodi road; their carrying capacity is 3,500 rotls.

The bull is very susceptible to pneumonia, but the average percentage of losses is approximately 20 per cent. only.

Motor transport of a light type could also be utilized on the Tonga—Talodi road.

Upper Nile Province and Sobat Pibor Province. Pack camels, Abyssinian mules and donkeys have all been utilized in these provinces; the mortality in camels, however, has been found to be very heavy, and it is considered that the pack mule and pack donkey are the best means of transport.

The pack mule carries a load of 150 lb. made up in two 75-lb. packages.

In both these provinces the country is chiefly black 'cotton soil' which renders it unsuitable for wheeled transport.

**Bahr el-Ghazal Province.** In the Bahr el-Ghazal donkeys and mules are invariably used, and it is found that by giving them periodical doses of arsenic they are rendered less susceptible to trypanosomiasis.

Pack donkeys are used on the following routes :

Shambe—Wau.

Wau—Tembura.

„ Kafia Kingi.

„ Raga.

„ Nyamllell.

„ Meshra.

The load consists of 100 lb. (two packages of 50 lb. each), in addition to which the animal is capable of carrying his own forage for 7 days, which on the march consists of 2 lb. of grain daily, the ration being increased to 3 lb. when in standing camps.

Mule carts are used on the following roads :

Shambe—Rumbek.

„ Lau.

„ Meridi.

„ Wau.

„ Yambio.

The weight carried by these carts is 400 lb. The weight of the cart itself is 240 lb. This cart can also be utilized with donkeys (in tandem).

Bulls are used as draught animals by the government between Shambe—Rumbek—Tonj and Wau, from Wau to Meshra, and from Rumbek via Atwot to Mvolo. The presence of the tsetse fly in the southern and western portions of the Bahr el-Ghazal prevent the use of bulls in these parts. The form of bull transport in use is a pair of bulls in a cart known as the Kadugli pattern

bull cart, as used on the Tonga—Talodi road in southern Kordofan. Such a cart will carry a load of from 750–900 lb., the weight to be carried depending on the condition of the road.

Camels have also been experimented with as pack animals in this province, but the mortality was very high, and it has been found that mules and donkeys are generally the most suitable.

**Mongalla Province.** In Mongalla Province pack donkeys have also been found to be the most suitable form of transport.

On the Rejaf—Libogo road motor transport can also be utilized.

Light cars such as Ford touring cars and vans, also Crossley cars, are considered the most suitable for work in this country.

Bull carts drawn by two bulls have also been utilized on a small scale for civil transport work with success.

**General.** Carriers (porters) are also used for transport purposes in the following provinces :

Bahr el-Ghazal.

Mongalla.

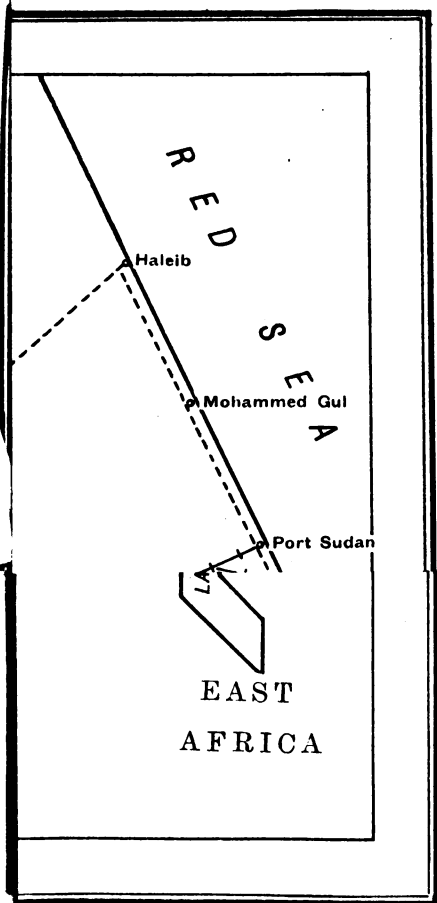
Upper Nile.

The load for a carrier is 50 lb.

For transport by river or road travellers should generally make application to the local authorities, governors, or mamurs, who keep lists of camel owners, boats, &c. Travellers can generally hire camel or donkey transport at any of the larger towns, but as much notice as possible should be given regarding camel hiring, as the animals are usually kept some days' march inland for grazing purposes.

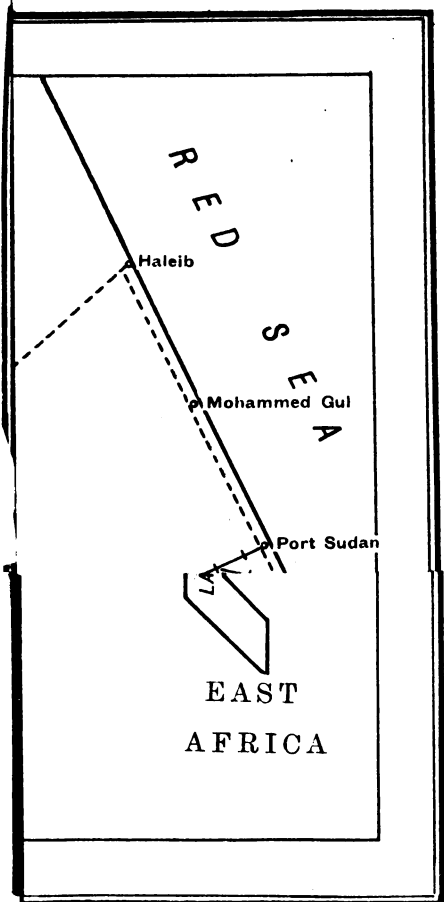












Abu F  
Abu F  
Aswar  
Assint  
Athara  
Berber  
Berber  
Berber  
Bir Ga  
Bir el-  
Bir el-  
Bir Ko  
Bir Ki  
Bir Ki  
Bir Li  
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Bir Un  
Erkow  
Erkow  
Haleib  
Haleib  
Jebel T  
Kena  
No. 6 S  
Obak V  
Port St  
Salom  
Selima  
Sherek  
Suakin  
Suakin  
Suakin  
Suakin  
Suakin  
Suakin  
Trinkit

Abu Fr  
Abu Sh  
Abu Us

## TABLE OF DISTANCES BY ROAD

## NORTHERN SUDAN

	miles
Abu Hamed—Haleib (Red Sea Coast) . . . . .	352
Abu Hamed—Bir Shigrib . . . . .	83
Aswan—Deraheib . . . . .	229
Assiut—El-Fasher (Arbain Road) . . . . .	1,000
Atbara—Kassala . . . . .	226
Berber—Kassala . . . . .	246
Berber—Obak Wells . . . . .	59½
Berber Suakin . . . . .	241
Bir Gabatit—Bir Gonarawi (W. Atiab) . . . . .	126
Bir el-Nigeim—Bir Komotit . . . . .	63
Bir el-Nigeim—Musmar Railway Station . . . . .	166
Bir Komatit—Murrat Wells . . . . .	219
Bir Kiau—Bir Nurayet . . . . .	130
Bir Kiaou—Bir Gabateit (W. el-Kua) . . . . .	58
Bir Likeit—Bir Um Alam . . . . .	74
Bir Shigrib—Bir Kiau . . . . .	67
Bir Um Alam—Bir Kiau . . . . .	34
Erkowit—Sinkat (via K. Gebet) . . . . .	23
Erkowit—Sinkat (via Baramil Plains) . . . . .	21½
Haleib—Port Sudan (via Mohammed Gul) . . . . .	202½
Haleib—Um Nabardi Mines . . . . .	313
Jebel Teskei—Bir Shigrib . . . . .	82
Kena—Kosseir . . . . .	118
No. 6 Station (127 miles from Halfa)—Deraheib . . . . .	208
Obak Wells—Bir el-Nigeim . . . . .	106
Port Sudan—Sinkat . . . . .	68
Sallom—Sinkat . . . . .	55½
Selima—Nile opposite Kosha . . . . .	79½
Shereik (El.)—Bir el-Nigeim . . . . .	72
Suakin—Berber (northern route) . . . . .	251
Suakin—Erkowit (via Kolkolai Pass) . . . . .	34
Suakin—Erkowit (via Tamineb, K. Arab) . . . . .	39
Suakin—Tokar . . . . .	56
Summit—Erkowit . . . . .	22
Trinkitat—Tokar (via Teb) . . . . .	17½

## GEZIRA

Abu Fru and Hassaheissi—El-Ogda . . . . .	32
Abu Sheneina—Roseires . . . . .	49½
Abu Ushar—Salim . . . . .	18

	miles
Bagadi—Beriab el-Hogeir (via Homr and El Hosh) . . . . .	36½
Ereital—Sennar (via Sarrag, El-Hoggag, and Ewisab) . . . . .	52
Gedaid (El-) and El-Masudia—Erribi . . . . .	26
Geteina (El-)—Abd el-Majid (via El-Telch) . . . . .	31
Gezzan—Abu Sheneina . . . . .	47½
Goz Abu Guma (Zeinuba)—Jebelein (via east bank) . . . . .	46
Hassaheissi—El-Ogda (via Um Odam) . . . . .	30
Hassaheissi—Managil . . . . .	43½
Hassaheissi—Mesellemia and Wad Medani . . . . .	27½
Hillet Abbas—Jebel Sagadi . . . . .	45
Hillet Aulad el-Fiki Imam—El-Geteina . . . . .	35½
Hillet Danga—Dar el-Imam . . . . .	46
Hillet Rizgalla—Kurmuk . . . . .	60
Hillet Senada—Jebel Mazmum (via J. Abu Ruagh and J. Bozi) . . . . .	65½
Hosh (El-)—Tobbakha (via El-Doba) . . . . .	11½
Jebel Aoli—Faragin . . . . .	18
Jebel Gule—Jebel Gerabin . . . . .	38½
Jebel Gule—Soda . . . . .	44
Jebel Gule—Renk (direct route) . . . . .	48
Jebel Jerok—Wad Deluka (via J. Eri, Kilwega) . . . . .	123
Jebel Mazmum—Jebel Gerabin . . . . .	21½
Jebel Sagadi—Sennar . . . . .	30½
Jebel Sagadi—Wad Medani . . . . .	64
Jebel Soda—Jebel Keili (via K. Misca and Jebel Dunderu) . . . . .	46
Jebel Ulu—J. Ahmed Agha . . . . .	58
Jebelein—Renk . . . . .	61½
Kababish—Nuzl Hejirat (via Hagu, El-Ehcimer, and Ewisab) . . . . .	32
Kamlin—Salim and El Kheiran . . . . .	38
Katfia—Abd el-Majid . . . . .	26
Kawa—Maatuk (via Gaboga) . . . . .	41
Keili—Roseires (via K. Offat) . . . . .	85
Keratib—Wad el-Haddad (via Fahl, Tobbakha, and Doma) . . . . .	23
Keteir—Jebel Sagadi . . . . .	38
Khartoum—El-Geteina (by east bank of White Nile) . . . . .	56½
Khartoum—Managil . . . . .	108½
Khor Machar (mouth of)—Nasser (via Gargwang Terru) . . . . .	47
Kurmuk—Abu Sheneira . . . . .	73½
Kurmuk—J. Ulu . . . . .	65½
Kurmuk—Kirin (Abyssinia) . . . . .	53
Kurmuk—K. Yabus (via K. Tombakh) . . . . .	55
Maatuk—Aulad Fiki Imam (via Mutturab) . . . . .	36½
Managil—El-Dueim . . . . .	49
Managil—J. Gule . . . . .	195½
Managil—Sennar (via Wad El-Haddad) . . . . .	74½

# TABLE OF DISTANCES BY ROAD

573

	miles
Masid (El.)—Azrak and Salim . . . . .	29
Masid (El.)—El Areik . . . . .	26½
Melut—Kirin District . . . . .	149
Meshra Zeraf—Keili . . . . .	208½
Meselemia—Fregab and El Ogda . . . . .	23½
N. Machar—Nasser (via north bank of Sobat and Baro). . . . .	54
Roseires—J. Gerabin (via J. Agadi) . . . . .	48
Roseires—J. Gule . . . . .	62
Roseires—Kurmuk (by west bank) . . . . .	120
Roseires—Singa (by west bank) . . . . .	110½
Roseires—Soda (via J. Agadi) . . . . .	64
Roseires—Soda (via Jebels Bagis and Kukur) . . . . .	64½
Sennar—Singa (direct) . . . . .	42
Shoa—Hillet Darga . . . . .	21
Soda—Kurmuk . . . . .	64½
Talbab (El) (Meshra Haz Sulciman)—Turis . . . . .	21½
Taufikia—Abwong . . . . .	53
Taufikia—Akobo . . . . .	220
Taufikia—Nasser . . . . .	139
Torut—Shoa (via Kierdi and Banwaro) . . . . .	40
Torut—Yalga . . . . .	28
Yalga—Shoa . . . . .	20
Wadi Shau—Laota . . . . .	32
Wad Medani—Managil . . . . .	37½
Wad Medani—Wad el-Zein . . . . .	33½

## WHITE NILE AND SOBAT

Abwong—Nasser . . . . .	86
Abwong—Akobo . . . . .	147½
Fauwel—River Kir . . . . .	43¾
Gambeila—Abwong (by north bank of Baro and Sobat) . . . . .	169
Gambeila—Addis Abeba . . . . .	331½
Gateina (El) —Guez (via Awamra country) . . . . .	36½
Jebelein—Soteir . . . . .	78½
Khartoum—Goz Abu Guma (up right bank of White Nile) . . . . .	180½
Khartoum—Jebelein (up right bank of White Nile) . . . . .	225
Kodok (opposite to)—Uryong on the Sobat . . . . .	48
Nasser—Addis Abeba . . . . .	430
Nasser—Akobo . . . . .	70
Renk (opposite to)—Kodok (Dunjol) . . . . .	181
Uryong (on Sobat)—White Nile (opposite Kodok) . . . . .	48

## BLUE NILE

Abu Deleig—Kamlin (via Wad Hassura and El Akora) . . . . .	110
Abu Haraz—Gedaref (via El-Fau) . . . . .	142

	miles
Abu Shaneira—Menze (via Fazogli el-Sharg) . . . . .	49½
Beidumger Hafir—Wad Rowa . . . . .	56½
Debarki—Gedaref (via Hillet Shammam and J. Ban) . . . . .	113
Debarki—Meshra Homra el-Gizim . . . . .	49½
Dindar (mouth)—Sheikh Talha (via east bank of Blue Nile) . . . . .	57
Dunkur—Gezirat Um Orug (via the Dinder) . . . . .	96
Famaka—Addis Abeba . . . . .	432
Gallabat—Addis Abeba . . . . .	373
Gallabat—Meshra Homra el Gizim . . . . .	71½
Gedaref—Gallabat . . . . .	94
Gedaref—Khor Simsim mouth on River Rahad . . . . .	104½
Gedaref—Wad Medani . . . . .	137
Gak el-Rusval—Hillet Kauli . . . . .	21
Hawata (El)—J. Beila . . . . .	26
Hillet Galegu—Abu Hashim . . . . .	61
Jebel Geili—Kamlin . . . . .	51
Jebel Ummat Rumeila—Mafaza (direct) . . . . .	49
Kamlin—Abu Deleig . . . . .	75½
Kamlin—Abu Deleig (via J. Geili) . . . . .	84½
Khartoum—Kamlin (Sharg) (via east bank of Blue Nile) . . . . .	61
Khor Mugdeid—Ras Amer (along Khor Galegu) . . . . .	31
Khor Simsim—Gedaref (via J. Simsim) . . . . .	84½
Lueisa—Hawata (via Abu Hashim) . . . . .	68
Mafaza—Gedaref . . . . .	67
Mafaza—Sennar (via Wad el-Rekein) . . . . .	81
Mafaza—Sergu (via Lueisa) . . . . .	60
Meshra el-Dereissa—Khor el Mugdeid . . . . .	32½
Nawara (on Rahad)—Wad el Haddad rly. stn. on Blue Nile . . . . .	42
Roseires—Abu Shaneira (by right bank) . . . . .	45
Roseires—J. Abu Ramla (direct) . . . . .	58
Rufaa—Geili . . . . .	61½
Sennar—Mafaza (via Meshra Kauli) . . . . .	70
Sergu—Debarki (via Abu Hashim) . . . . .	40
Singa—Roseires (via Karkoj Ferry) . . . . .	107
Um Dehir—El Hawata (direct route) . . . . .	39
Wad el-Abbas—Wad Daud . . . . .	21
Wad Medani—Gedaref . . . . .	139
Wad Medani—Khartoum (via right bank of Blue Nile) . . . . .	123½
Wad Medani—Mafaza . . . . .	87½

## KASSALA

Abu Deleig—Isna Bir . . . . .	24½
Abu Deleig—J. Geili . . . . .	27
Abu Deleig—Kamlin (via Wad Hassuna, Abu Zaleig, and Elwan) . . . . .	86½
Adarama—Bir Oshi (Khor Largeb) . . . . .	158

## TABLE OF DISTANCES BY ROAD

575

	miles
Adarama—Goz Regeb . . . . .	83
Atbara—Adarama . . . . .	76
Doka—Sofi (via Abu Gulud) . . . . .	59
Eilafun—Elwan and Beidumger (by indirect route) . . . . .	58½
Einha—Rufaa . . . . .	335
Gedaref—Gallabat . . . . .	97
Gedaref—Mogatta (direct route via Wad Kabu) . . . . .	56
Gedaref—Nogara . . . . .	146
Goz Regeb—Asubri . . . . .	63
Goz Regeb—Kassala . . . . .	70½
Goz Regeb—Shordi (via Abu Deleig) . . . . .	186
Kassala—Gedaref . . . . .	130
Kassala—Maman (direct) . . . . .	65
Kassala—Massawa . . . . .	240
Kassala—Mogatta . . . . .	70½
Kassala—Suakin (via Filik, Maman, and K. Siterab) . . . . .	297
Kassala—Sinkat . . . . .	252
Kassala—Thamiam . . . . .	212
Kassala—Tokar . . . . .	241
Kassala—Wad Heleiwa Road (via Umbrega) . . . . .	87½
Khartoum—Abu Deleig (via Awad Karim) . . . . .	98
Khartoum North—Kassala (via Geili, Sofeiga, and Asubri) . . . . .	257½
Khartoum North—Shendi (via Bir Ishabella and Naga) . . . . .	120
Mogatta—Gedaref (via Tomat and Rawashda) . . . . .	68
Mogatta—Gedaref (via Tomat and Sofi) . . . . .	74
Shasheira—Doka (via Abu Gulud) . . . . .	38
Sofi—Seraf Said (via Abu Gulud) . . . . .	76
Thamiam—Kassala (via K. Langeb) . . . . .	203½
Thamiam—Kassala (via Tibilol) . . . . .	219½
Tokar—Kassala (via K. Baraka) . . . . .	236
Umbrega—Gallabat (via Bahr el-Salam) . . . . .	104½
Umbrega—Wad Haleiwa . . . . .	45
Wad Hassura—Abu Deleig . . . . .	66

## DONGOLA

Ambigol or Korti—Metemma . . . . .	176
Bayuda Wells—Tangase Market . . . . .	63½
Debba—Elai (direct) . . . . .	110
Debba—Gabra Wells (via K. Wahri) . . . . .	156
Debba—Khandak . . . . .	49½
Dongola—Bir Sultan (Arbain Road) . . . . .	310
Dongola—El Margumi . . . . .	58½
Dongola—Lagia el-Kebir (Arbain Road) . . . . .	166
Ein (El)—Debba (via Soteir and Fogi) . . . . .	146



	miles
Elai—Soteir . . . . .	55½
Elai Wells—J. Abu Hashim . . . . .	29
Gabra—Gamber and Elai . . . . .	58
Gabra—Korti . . . . .	150
Gabrat el-Said—Omdurman . . . . .	56
Gaerin—Abu Dom (near the Shabluka Gorge) . . . . .	57
Jebel Abu Hashim—Debba (via Wadi Abu Sayal) . . . . .	86½
Jebel Rayan—Bayuda (via Hamboti Wells) . . . . .	96½
Jura—Kerbekun . . . . .	54
Khandak—El Margumi . . . . .	23½
Korti—Bayuda and Sedeiri . . . . .	65
Korti—Bayuda and Sedeiri . . . . .	74
Korti—Bayuda Wells . . . . .	54
Korti—Metemma . . . . .	176
Lagia—Dongola . . . . .	29
Matassi (El)—Matassi (via Nusub Saleh and Nusub el Rugr) . . . . .	67½
Matassi—Lagia (via Bayuda) . . . . .	78½
Merowe—Berber (via Sani) . . . . .	149
Merowe—Jakdul . . . . .	99
Omdurman—Shabluka . . . . .	44½
Rogan—Bayuda (via Hamboti Wells) . . . . .	96½
Sani—El Zuma (Nile) (via Jura) . . . . .	85
Selima—Nile (opposite Kosha) . . . . .	79½
Shendi—Jakdul . . . . .	75
Soteir—Abu Taberi and Bir Sultan . . . . .	249½

## KORDOFAN

Abu Agaga—Bara . . . . .	118
Abu Galb—El-Odaiya (via Abu Zabbad) . . . . .	92
Abu Gibeiha—Um Zoga (via Kurun) . . . . .	24
Abu Zabbad—Dilling . . . . .	44½
Abu Zabbad—El-Nahud (via Abu Shariha) . . . . .	63
Abu Zabbad—El-Nahud (via Um Ragatti) . . . . .	61½
Abu Zabbad—El Obeid . . . . .	97½
Bagbag Wells—Gabra Wells . . . . .	55½
Bara—Bir Soderi (direct) . . . . .	104½
Bara—Bur Islam (via El Gleit) . . . . .	135
Bara—El Obeid . . . . .	37
Bara—J. Abu Tabr (via Gabra el-Sheikh) . . . . .	114½
Bara—J. Milesa . . . . .	31
Bara—J. Um Seidera . . . . .	54
Bara—Kagmar . . . . .	49½
Bara—Omdurman (via Homra) . . . . .	213½
Bara—Um Soneita . . . . .	152½

## TABLE OF DISTANCES BY ROAD

577

	miles
Baraka (Hillet Abu Shama)—El-Odaiya (via El Buta) . . . . .	97½
Bir Soderi—Um Suneita . . . . .	61
Bir Sultan—Bagaria . . . . .	246½
Bur Islam—Dam Gamid (via Um Bel) . . . . .	97
Bur Islam Wells—Foga . . . . .	51½
Dam Gamid—Hafir Ogr (via Wad Bahr) . . . . .	101½
Dawas (Bab el-Homr)—Dar Jango (Bab el-Arab) . . . . .	87
Debib—Turda—Fauwell Road . . . . .	16½
Debba—El-Obeid (via Wabri, Elai, Safia, Kogmar) . . . . .	362
Dilling—El-Obeid (via El Edaiya, Gaibat, and Tomeid) . . . . .	100½
Dilling—J. Shwai . . . . .	84
Dilling—Kadugli . . . . .	78
Dueim (El)—El-Obeid (via Hashaba) . . . . .	155
Dueim (El)—El-Obeid (via Homra) . . . . .	186
Dueim (El)—Homra . . . . .	62½
Dueim (El)—Taiara Merkaz (via Bashom) . . . . .	124½
Dueim (El)—Um Dam (via Hashaba) . . . . .	91½
Efeira (El)—Abu Riglain (via Doleib) . . . . .	38
Ein (El.)—Debba (via Soteir and Fogi) . . . . .	146
Ein (El.)—Soteir . . . . .	78½
Eliri—Oruntie . . . . .	35½
Fagai—Bahr el Homr—Turda . . . . .	48
Fatasha—Gabrati el-Gimal (via Shobali) . . . . .	44
Firga—Kaja Soderi . . . . .	23
Foga—Kaja (Bir Soderi) . . . . .	97
Foga—El-Nahud . . . . .	86
Foga—Um Badr (via J. Zeinad Rowein) . . . . .	51
Fungor—J. Eliri . . . . .	35½
Fungor—J. Gedir . . . . .	36½
Gashta Wells (Rabad)—Um Seneita Wells . . . . .	89
Gedid—El Dueim (via Um Deisis) . . . . .	81½
Gedid—J. Kon . . . . .	51
Gedid—El-Rahad . . . . .	118
Gedid—Tagale (via Dar El-Ahamda) . . . . .	104
Gerinti—Mek Kwal's village (Dinka) (along the R. Gurf) . . . . .	60
Ghereigs (Muglud)—Gerinti and the River Gurf (via El Jagha, Bata Sherif, Konga, El-Debba, and Tigil) . . . . .	93
Gleit (El)—El-Nahud . . . . .	113½
Goz Abu Guma—Dar el Ahamda . . . . .	74½
Goz Abu Guma—El-Obeid (via Sherkeila and Rahad) . . . . .	211
Gurdud—Kurongo . . . . .	26½
Habisa—Omdurman (via Bagbag and Fatasha Wells) . . . . .	96
Hafir Ogr—El Nahud . . . . .	104½
Hafir Ogr—El Odaiya . . . . .	78½

SUDAN

p p

	miles
Haraza (El) (H. Dar Zungol)—Kaja Soderi . . . . .	89½
Heiban—Tira Mandi (via Tira El-Akhdar) . . . . .	32
Hilla and Jebel Kon—El-Duoim (via Zereiga Wells) . . . . .	77½
Hillet Sumra—J. Gashta . . . . .	88
Homra—Bara . . . . .	86
Homra—El-Obeid . . . . .	123
Hufra—Foga . . . . .	65
Id el-Marakh—Firga . . . . .	48½
Id el-Merakh—Habisa Wells . . . . .	113½
Id el-Merakh—Um Soncita . . . . .	54½
Jebel Abu Tabr—Bagbag Wells (via Um Meira) . . . . .	45¼
Jebel Abu Tabr—Fatasha (via Um Inderaba) . . . . .	77½
Jebel Abu Tabr—Gabra Wells . . . . .	99
Jebel Abu Tabr—Omdurman . . . . .	99½
Jebel Ambri (Koalib)—Um Abdulla . . . . .	26
Jebel Bir Serar—Homra (direct) . . . . .	67½
Jebel Bir Serar—Tuffalung . . . . .	65
Jebel Daduri—Chamchaka (via Jebels Wadelki and Takam) . . . . .	27½
Jebel Dago—El Odaiya . . . . .	85
Jebel Dago (Dar el Kebir)—Kadugli Merkaz (via Lake Keilak) . . . . .	79¼
Jebel Daier—Dilling (via J. Kadero and El Nila) . . . . .	87
Jebel Eliri—Tonga . . . . .	61
Jebel Eliri—Tonga (via J. Korandi and Doleiba) . . . . .	113
Jebel Gashta—Um Bell . . . . .	72
Jebel Milesa—Um Guerfa District (Hillet Habasa) . . . . .	27½
Jebel Sileike—Kadugli (via J. El-Arid) . . . . .	56
Jebel Tagale—Kaka (White Nile) (via Balula and Seragia) . . . . .	142
Jebel Tagale—Um Ashrin . . . . .	136
Jebel Zerga—J. Zeinad Roian . . . . .	32½
Jedid—J. Kon . . . . .	51
Kadero—Dilling . . . . .	70
Kadugli—J. Dar el-Kebir . . . . .	52
Kadugli—J. Shwai (via Um Shcheita) . . . . .	49½
Kadugli—Talodi . . . . .	57
Kagmar—El Safia (via El Wuz) . . . . .	82¾
Kagmar—El Safia (via H. Dar Zargol) . . . . .	77½
Kagmar—Id el-Merakh . . . . .	78½
Kagmar—Um Heglug (via Shershar Wells) . . . . .	54
Kaja el-Hofra—Bara (via Girgell) . . . . .	114
Kaja Soderi—J. Ein . . . . .	150
Kaja Soderi (Hillet Sheikh Niuma)—Hufra . . . . .	27
Kaja Soderi—Um Badr . . . . .	77½
Kaja Soderi—Shershar . . . . .	51½
Kaka—El-Ardeb (opposite Jebel Ein) . . . . .	163

	miles
Kaka-Talodi (via Defala, J. Nyaro, J. Teraira, and J. Eliri) . . . . .	190
Keraja (Tagali)—Tendik . . . . .	47
Khor el Homra—Sungikai (Dilling Merkaz) . . . . .	19
Kodok—Fungor (via Fama) . . . . .	60
Konga el Desba (Homr)—Git (Dar Rizeigat, via Timeis and Haiyyaf) . . . . .	45
Kurongo—Kafira . . . . .	30 $\frac{1}{4}$
Mazrub—Bara (direct route) . . . . .	78
Mazrub Wells—Kaja Soderi . . . . .	35
Mek Koije's dug dug—Kurongo (via Abiad) . . . . .	23 $\frac{1}{2}$
Mek Kwal's village—J. Shat Safia (Nuba Mts.) (via Mellum, Agag, Murafacen, and Um Gallaha) . . . . .	145
Muglad (Ghereiga)—Turda (via El-Kurru) . . . . .	78 $\frac{1}{2}$
Muglad (Hillet Reiga)—Turda (via Fula Aradaia) . . . . .	70 $\frac{1}{2}$
Murtumshei (El-) Wells—Turda . . . . .	101
Nahud (El)—Bur Islam Wells . . . . .	79 $\frac{1}{4}$
Nahud (El)—Dam Gamad . . . . .	73
Nahud—El-Fasher . . . . .	236
Nahud (El)—El-Odaiya . . . . .	49
Nahud (El)—El-Odaiya (via Abu Hameira) . . . . .	51
Nahud (El)—El-Odaiya (via Rahad el-Sabagh) . . . . .	50
Nahud (El)—El-Seneita (via El-Sinut) . . . . .	61 $\frac{1}{4}$
Nahud (El)—El-Zerga (Saata District) . . . . .	73
Nahud (El)—J. Zerga (Kaja Serug) . . . . .	83 $\frac{1}{2}$
Nyaro—Werna . . . . .	29
Obeid (El)—Abu Zubbad . . . . .	106
Obeid (El)—Bur Islam Wells . . . . .	74
Obeid (El)—Dilling . . . . .	92
Obeid (El)—El-Fasher . . . . .	446
Obeid (El)—Foga (via El-Gleit, Mosrub, Guradi) . . . . .	203
Obeid (El)—El-Gleit (via Abu Sinun) . . . . .	64 $\frac{1}{2}$
Obeid (El)—El-Nahud . . . . .	130
Obeid (El)—El-Nahud (via Dudia) . . . . .	143
Obeid (El)—Dar el-Jange . . . . .	328 $\frac{1}{2}$
Obeid (El)—J. Daier . . . . .	57
Obeid (El)—Kimla in J. Daier (via Hillet Abd el-Sammatt) . . . . .	82 $\frac{1}{2}$
Obeid (El)—El-Odaiya (via Sungikai) . . . . .	211
Obeid (El)—Sungikai . . . . .	67
Obeid (El)—Taiara Merkaz . . . . .	37 $\frac{3}{4}$
Obeid (El)—Talodi (via Abu Zabbad, Dilling, and Kadugli) . . . . .	275
Obeid (El)—Talodi (via Tendik) . . . . .	225
Obeid (El)—Tendik (via Batha) . . . . .	140
Odaiya (El)—Abu Zabab (via Teibun) . . . . .	75 $\frac{1}{2}$
Odaiya (El)—Ghereiga (in Muglad) (via Gaghamni and Kigeira) . . . . .	90 $\frac{1}{2}$
Odaiya (El)—Muglad (Hillet Ghereiga) (via Um Sidr) . . . . .	87

	miles
Odaiya (El.)—Sayala . . . . .	49
Odaiya (El.)—Um Gerru (via Gaghamni) . . . . .	59½
Omdurman—Bagbag Wells (via Um Teital) . . . . .	67½
Omdurman—El-Safia . . . . .	161½
Omdurman—Habisa (via Dueim Wells and Gabra el-Gamal) . . . . .	108
Omdurman—Homra . . . . .	128
Omdurman—Shageig . . . . .	98
Rahad—Nahud . . . . .	184½
Rahad—Sungikai . . . . .	74
Rashad—Koalib (via J. Tagoi and Um Bereimbeita) . . . . .	56
Safia (El.)—Elai (via Hobagi Wells) . . . . .	100½
Safia (El.)—Id el Marakh . . . . .	34
Safia (El.)—Wadi el Melik or Melh (via Gebeilat Kaja) . . . . .	142½
Shageig—Homra . . . . .	34
Shallota Nebelat (or El-Haggara)—Foga . . . . .	84
Shawal—Gedid (via Fashi Shoya) . . . . .	56
Sheg (El.)—J. Girada . . . . .	35
Shegeig—Kagmar (direct) . . . . .	116
Sheikeila—Keraia (Tagale District) . . . . .	53
Sineita (El.)—Burdia . . . . .	46½
Sinut (El.)—Murtumshei Wells . . . . .	54½
Soderi Wells—Kagmar . . . . .	95
Sungikai—Dilling . . . . .	23
Taiara Merkaz—J. Kon (via Hilla Yasin) . . . . .	65½
Talodi—J. Eliri . . . . .	32
Talodi—Heiban . . . . .	53
Talodi—Lake Abiad (via Gerdud-Krongo) . . . . .	54
Talodi—Tira el-Akhdar . . . . .	38½
Talodi—Tonga . . . . .	101
Tendik—J. Delami . . . . .	54
Tendik—Um Zoga . . . . .	38
Tendik—Nyaro . . . . .	93
Tira el-Akhdar—Lukka (via Errio) . . . . .	27½
Tonga—Talodi . . . . .	57
Turda—El-Odaiya . . . . .	153
Turda—Hasoba . . . . .	44½
Turda—Keilak . . . . .	93
Um Badr—Kaja Soderi (via Kaja el-Hofra or Nagut) . . . . .	87
Um Dam—Bara . . . . .	43
Um Dam—El-Obeid (via Bagboji) . . . . .	66
Um Dam—El-Obeid (via Um Bosha) . . . . .	69
Um Guerfa District—J. Abu Tabr (via Gabra el-Sheikh Wells) . . . . .	53½
Um Sidr Wells—El-Safia (via Munderaba, Bagbag, and El-Habisa) . . . . .	140
Um Suneita—El-Ein . . . . .	104½

## TABLE OF DISTANCES BY ROAD

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	miles
Zeinad Roian (Rowein—Gashta) . . . . .	28
Zereiga—Bir Serar . . . . .	18½
Zerga—El-Nahud . . . . .	99

## DARFUR

Abiad—El-Fasher (via Wada) . . . . .	176
Abu Gabra—Dara . . . . .	98
Abu Gabra—El-Odaiya (direct) . . . . .	150
Abu Gabra—Muglad (Ghareiga) (via Hayyoba) . . . . .	100
Ahamadei—Kabkabia (via W. Barei and J. Isaka) . . . . .	23
Anka—Meidob (via J. Tagabo) . . . . .	108¼
Bir Karnoy—Furawia (via Boba) . . . . .	38
Bir Karnoy—J. Darong . . . . .	25
Bir Karnoy—J. Darong (via Girbokai) . . . . .	30
Bir Malha—Bir Mileit (via Bir Madu) . . . . .	80¾
Bir Malha—Shakaka (via Duaini) . . . . .	28½
Dam Gamad—El-Fasher (via J. el-Hella and Abiad) . . . . .	165
Dara—El-Fasher . . . . .	105
Debbabin—Muttarig . . . . .	25
Dibbis—Nyala (via Birkawia) . . . . .	68
Dibbis—Zalinget . . . . .	72½
Fasher (El.)—Debbabin . . . . .	70½
Fasher (El.)—Kabkabia (Northern Road) . . . . .	95½
Fasher (El.)—Kabkabia (Southern Road, via Om and Kowra) . . . . .	102½
Fasher (El.)—Kas . . . . .	118
Fasher (El.)—Kuttum . . . . .	59¼
Fasher (El.)—Nyala (via Niteiga) . . . . .	135
Fasher (El.)—Tulu (via Duggam and Sania Karro) . . . . .	94
Fasher (El.)—Um Kaddada (via Alauni, Sania Karro, and Tisoma) . . . . .	135
Fugama—Anka (via Beri Wells) . . . . .	27
Furawia—Bir Karnoy . . . . .	30½
Farawia—Fula in Wadi Hawa . . . . .	32
Furawia—Sir (via Um Burru) . . . . .	70
Jebel Darong—Bir Karnoy (via Girbokai) . . . . .	30
Jebel Meidob—Kaja Soderi . . . . .	189
Kabkabia—J. Konio and Wadi Azum . . . . .	82½
Kabkabia—Wadi Saga (via Geldama and Wadi Barei) . . . . .	26¾
Kaja Serrug—J. el-Hella (via Karnak Wells) . . . . .	46½
Karnoy—Oruba (via Undur) . . . . .	87
Mileit—Kuttum (via Bir Daiyu) . . . . .	63
Musbat—Furawia . . . . .	47½
Musbat—Lil Korat (via Geideri and Bir Lil) . . . . .	16
Muttarig—Orori . . . . .	49
Nyala—Dibbis . . . . .	80

	miles
Odayia (El.)—Taweisha (via Um Sayal, Hafir Ogr, and Inderab)	147
Orori—Fugama (via Gassawa and Dubba)	40½
Oruba—Bir Karnoy (via Bamina)	67
Rungatas on Wadi Zibda—Zalingei	88
Sania Karro—El-Fasher (via K. Abu Deleig)	47
Shamadei—Kabkabia (via Wadi Barei and J. Isaka)	23
Taweisha—El-Fasher (direct route)	119
Um Burru—Musbati (via Kastî)	36
Um Shanga—J. el-Hella	16
Wad Orori—Musbati	12½
Wadi Seligatt—Furawia (via Mishi)	72½

## BAHR EL-GHAZAL

Agag—Meshra el-Rek	225½
Atwot Post—New Mvolo (via Ayuk)	47½
Chak Chak—Deim Zubeir	92
Chak Chak—Nyamlell	39
Deim Zubeir—Raga (via J. Zakka)	72
Eerie Post—Kafiakingi	97
Gnopp—K. Ororo	36
Gnopp—New Mvolo (direct)	31
Injiki (late Baka Taka)—M'Vuto	21
Issu River, Post (Yango's)—Bangbi	36½
Issu River—Belgian Post Maiwa	34
Kabaluzu—Bahr el-Arab (via J. Eerie)	26½
Kabaluzu—Kafiakingi	84½
Kafiakingi—Eerie Post	97
Kafiakingi—Hofrat el-Nahas	41
Kafiakingi—River Umbelasha (N'Dele Road, French boundary)	65
Keilak—Wau	363
Kojali—Tembura's	49½
Kojali—Tonj	129
Kossinga—Chak Chak	69½
Kossinga—Kabaluzu	78
Kossinga—Raga	27½
Kossinga—Sheikh Langi	93
Lake No—Warrana Wood Station	177
Lao Post—Mvolo (via Lau or Yei River)	67½
Lau—Ardeiba (via Hilla Nuer)	96
Lau Post—Shambe	39
Madebe—Sheikh Binza's village (via Mangi, Bingozegina, and Zemio)	128½
Meridi—Yambio	92½
Meshra el-Rek—Wau	107½

	miles
Meshra el-Rek—Tonj . . . . .	106
Mvolo—Kiro (Bahr el-Jebel) . . . . .	201½
Mvolo—Meridi . . . . .	108
Mvolo—Sheikh Tomba (White Nile) . . . . .	135
M'onto—Tombura (via Wando) . . . . .	46¾
N'Dessi—Zungumbia . . . . .	17½
New Mvolo—Rumbek . . . . .	54¾
Nyamlell—Raga (via Telegona and Kussinga) . . . . .	124
Pongo River—Taufikia . . . . .	391½
Raga—Eerie Post (vai Kabaluzu) . . . . .	88
Raga—Kabaluzu (via Sheikh Babur and Shergania) . . . . .	66
Raga—Kafiakingi . . . . .	141
Raga—Kafiakingi (via Said Boldas) . . . . .	150
Raga—Kossinga . . . . .	27
Raga—Nyamlell . . . . .	116
Rikita—Tonj . . . . .	143½
Rikita—Yambio . . . . .	53½
Rikita—Yambio . . . . .	94
Riktas Post—Tembura Post (via Hernies Country) . . . . .	88½
Rumbek—Awodi (across Naam) . . . . .	83
Rumbek—Darago's and Mvolo . . . . .	81
Rumbek—Knopp . . . . .	65
Rumbek—Lau Post . . . . .	65½
Rumbek—Mangi . . . . .	204
Rumbek—Meridi (via Meridi River) . . . . .	170
Rumbek—Meshra el-Rek (eastern route via Agar country) . . . . .	138
Rumbek—Meshra el-Rek (western route through Raik Dinka country) . . . . .	132
Rumbek—New Mvolo . . . . .	53½
Rumbek—No. 4 Rest House, Meridi Road (via Atwot and Gnopp) . . . . .	117
Shambe—Lao . . . . .	35½
Shambe—Rumbek (via Lau Post) . . . . .	102½
Sheikh Tombe—Amadi Road . . . . .	97½
Sheikh Tombe—Kenisa (via Sheikh Anok) . . . . .	113½
Sueh River—Yambio Post . . . . .	42
Tembura—Gonbere (French Congo) . . . . .	64
Tembura—R. Moia on Yambio Road . . . . .	69
Tembura—N'Doruma . . . . .	48
Tembura—Zungumbia . . . . .	69
Tembura's—Wando's . . . . .	37
Tonj—Rikita . . . . .	143½
Tonj—Rumbek . . . . .	89¾
Wando—Injiki (late Baka Taka) . . . . .	26½
Wando's—Zungumbia . . . . .	66
Wau—Chak Chak . . . . .	127½



	miles
Wau—Deim Zubeir (direct route)	139½
Wau—Hofrat el-Nahas	400
Wau—Kojali	135¾
Wau—Meshra el-Rek	107
Wau—Nyamlell	160
Wau—Raffiti (via River Road)	74½
Wau—Rumbek	161
Wau—Tembura (via Sikat el-Atesh)	181
Wau—Tonj	60½
Yambio—Bafuka (Congo)	47¾
Yambio—Mangi	43
Yambio—K. Moia on Tembura Road	43
Yambio—Sueh River	51½
Yambio—Tembura	110
Yambio—Tonj	240
Yambio Post—Rikita	53½
Zengumbia—Yambio	44
Zengumbia—Lingassi River	25½
Zengumbia—Tembura	73

## MONGALLA

Agoi—Akobo Post (via K. Adeit (Geni))	107
Akobo Post—Bonjak Post	33
Anwom—Fakam	26½
Bonjak—Junction of K. Denyufilo with R. Agwei	16½
Bonjak Post—Bonjak (via K. Abara)	20
Bonjak Post—Pibor Post	53½
Book—Ayod and Rual	9½
Bor—Duk Fauwil	93¾
Bor—Fort Bruce	140
Duk Fawil—Anwom (via Duk Fadiat)	33
Faddiak—Duk Fadiat	21
Fading—Keik	43½
Fakam—Faddiak	15½
Fulfahm—Duk and Fading	105
Gondokoro—Tarangole	69
Lado on K. Filus—Nyerol (via Mwot, Did, Shit, Thoe)	69½
Meshra Gwagol—Khor Mwazlyel	27½
Mongalla—Gondokoro	23
Mongalla—J. Lafone	76½
Mongalla—Torit	92
Nyerol—Ket (via Dwoing, Faniang, Wungtau)	40
Nyerol—Lado on K. Filus (via Rundwal, Ryr, Dengkhur, and Fadoi)	101¾

	miles
Pibor Mouth—Akobo Post . . . . .	40
Pibor Post—Agoi and Lotimen (via the Lotilla River) . . . . .	49
Pibor Post—Bonjak Post (via Agwei and Kong Kong) . . . . .	53½
Pibor Post—Bor . . . . .	140
Rejaf—Kakokaji . . . . .	75
Rejaf—Loka . . . . .	64
Rejaf—Nimule (via River Road) . . . . .	117½
Rejaf—Nimule (via Upper Road) . . . . .	97
Rual—Amwom (direct road) . . . . .	14½
Shit—Ngiu . . . . .	18½
Tarangole—Oboya . . . . .	35
Torit—Ikito ('New Road') . . . . .	44
Torit—Ikito ('Old Road' via Tarangole) . . . . .	52½

## LADO

Amadi—Dulong (by west bank of river Yei) . . . . .	36
Amadi—Gado (via Warungwa by west bank of river Yei) . . . . .	55
Amadi—Telegraph (Tombe-Mvolo) Ferry on river Yei by east bank . . . . .	37½
Amadi—Warungwa (via Girma (Lorella)) . . . . .	50
Beringi—Bundukia . . . . .	65
Boundle—Kheiralla (Karrara) . . . . .	41¼
Bundukia—Beringwa (via Mokoto Mabe) . . . . .	39
Bundukia—Lado . . . . .	64½
Kagelu—Kapei (via Abdullah) . . . . .	36
Kajo Kaji—Arna . . . . .	104½
Kajo Kaji—Rejaf . . . . .	73
Kapei—Loka . . . . .	50
Karungwa—Gado (via the Kari river) . . . . .	20
Kheiralla (Karrara)—Kapei . . . . .	32¼
Libogo (near Aba)—Kheiralla (Karrara) and Wandī . . . . .	93
Loka—Guruguru . . . . .	46
Loka—Sheikh Pigga . . . . .	25
Loka—Yei . . . . .	28
Meridi—Boundle, near J. Ambeh . . . . .	22½
Mont Wati—Kajo Kaji . . . . .	77
Rejaf—Yei (motor road) . . . . .	92¼
Sh. Girma (Lorella)—Bundukia . . . . .	37
Wandī—Aba . . . . .	75
Wandī—Lorella and Bundukia . . . . .	86½
Warungwa—Gado . . . . .	20
Warungwa—Loga . . . . .	45
Yei—Kheiralla (Karrara) (direct) . . . . .	69½
Yei—Mont Wati (via Bangali) . . . . .	84½

## POSTAL AND TELEGRAPH FACILITIES

Every town or settlement of any importance in the Sudan has a post and telegraph office, permanent or travelling, though there are limitations attached to some of them, as follows. (For the travelling post, see below.)

Erkowit, Gebeit, and Sinkat are open in the summer months only, the two latter being visited by the travelling P.O. in winter; Karkoj does not accept telegrams; Awoi and Sabderat are telegraph offices only. Parcels are accepted at Karkoj, Roseires, and Singa only while steamers are running on the Blue Nile, and at Wau only while the Jur is open; in each case they must not exceed 5 kilos. in weight. The weight of parcels that may be sent from a number of the offices is limited to 3 kilos; Tonj is not open to parcels, while Mvolo and Rumbek have a restricted parcels service. Facilities at Gambeila are limited to ordinary correspondence and the sale of stamps, except from June to October inclusive, when it is visited by the travelling P.O. British postal orders are both issued and cashed at the great majority of offices, and, where not issued, are cashed, in all cases except Awoi and Kongor. There is a telegraph money order service between the United Kingdom and all money order offices in the Sudan (except Karkoj); no single order may exceed £40 sterling.

The following offices are open to Savings Bank business: Atbara, Berber, Dongola, El-Obeid, Gedaref, Halfa, Kassala, Khartoum, Khartoum North, Kosti, Merowe, Mongalla, Nahud, Omdurman, Port Sudan, Rejaf, Singa, Suakin, Tokar, and Wad Medani.

There is a wireless installation at the following places: El-Fasher, Gambeila and Nasser (these two connecting with the Sudan Telegraph System), Malakal, Port Sudan (see p. 590), and Wau.

*Travelling Post Offices.*—Travelling post offices visit all the stations that have no permanent office on the following railway lines: Khartoum—El-Obeid; (Jebel Moya in the

summer only); Halfa—Khartoum; Atbara—Port Sudan. Their facilities are limited to ordinary and registered correspondence and ordinary parcels.

Travelling post offices also visit the following places between Khartoum and Gambeila: Abwong, Doleib Hill, mouth of the Baro, Nasser (Wood Station), Torfoot, and the following on the White Nile twice a month: Jebelein, Kosti (Wood Station), Kaka, Kenisa (Wood Station), Lul, Malek, Meshra el-Zeraf (Wood Station), Shambe, Sheikh Tombe. They also call at all the steamer stations that have no permanent office between Kareima and Kerma, except during low Nile, when they do not get beyond Dongola. During this season the Argo mail is carried by camel. Three government launches are detailed for postal service. The travelling P.O.'s described in this paragraph transact all branches of business and take telegrams.

#### MAIL SERVICES

For days of the week, see *Mail Time Table*. The services are subject to alteration.

For details of postal service, e.g. money orders, insured parcels, inland and foreign rates, charges for telegrams, the *Sudan Post Office Guide*, obtainable at the Sudan Post Offices, should be consulted.

#### TELEGRAPH LINES

In addition to the telegraph lines following the Sudan Railways, there are the following:

1. Halfa—Abu Hamed, following the Nile.

This follows the line of the abandoned railway to Kerma, where it crosses the river to Argo, and from that point follows it closely, via Dongola, Khandak, and Korti to Merowe. Here it crosses the river to Kareima and follows it on that side to Abu Hamed.

2. Berber—Suakin.

This follows the regular caravan road through Obak and Ariab.

Khartoum and London	.	.	.	.	Arriving at and departing from Khartoum on Friday and Monday.
Khartoum and Cairo	.	.	.	.	Arriving at Cairo on Tuesday and Friday respectively, and leaving it on Monday and Thursday.
Khartoum and Bahr el-Ghazal. (The Wau mail is partly carried by runners)	.	.	.	.	Leaves Khartoum 6th of each month.
Khartoum and Rejaf (twice monthly)	.	.	.	.	Leaves Khartoum 6th and 21st, arrives Rejaf 20th and 5th; leaves Rejaf 21st and 6th, arrives Khartoum 2nd and 17th.
Khartoum and Blue Nile (twice weekly to Sennar and Karkoj, and weekly beyond)	.	.	.	.	9 hours to Sennar, 6 days farther by land to Roseires. When Blue Nile is navigable, mails are dispatched between Sennar and Roseires in alternate weeks by steamer.
Khartoum, Kosti, and El-Obeid (twice weekly)	.	.	.	.	13½ hours to Kosti; 28½ hours to El-Obeid.
Khartoum, Geteina, Duem, Kawa, and Kosti	.	.	.	.	1½ days. Leaves Khartoum 6th, 13th, 21st, and 28th of each month.
Khartoum to Suakin and Port Sudan via Atbara (twice weekly)	.	.	.	.	1½ days.
Atbara and Talodi via El-Obeid (weekly)	.	.	.	.	11 days.
Atbara and Kassala (weekly)	.	.	.	.	6½ days.
Kassala and Gedaref (weekly)	.	.	.	.	4 days.
Gedaref and Gallabat (weekly)	.	.	.	.	4 days.
Gedaref and Mafaza (weekly)	.	.	.	.	3 days.
Halfa and Delgo via Kosha (weekly)	.	.	.	.	5½ days.
Kassala and Sabderat (Eritrea) (weekly)	.	.	.	.	12 hours.
El-Obeid and Nahud via Abu Zabbad (weekly)	.	.	.	.	6 days.
Wad Medani and Gedaref (weekly)	.	.	.	.	6 days.
Taufikia-Abwong, Nasser, Akobo, and Pibor Posts	.	.	.	.	Mails leave Taufikia about the 13th and 28th of each month, and are forwarded by runner to Nasser, and thence to Akobo and Pibor Posts.
Suakin and Tokar (twice weekly)	.	.	.	.	1½ days.
Abu Hamed-Kareima-Merowe (weekly)	.	.	.	.	1 day.
{ Kareima-Merowe-Dongola-Argo (every 14 days)	.	.	.	.	Railway and launch
{ Merowe-Dongola-Argo via Moheila (every 14 days)	.	.	.	.	River
	.	.	.	.	Camel

The two above services in conjunction give a weekly service to and from Argo.

[mail is carried by camel.]

## 3. Suakin—Tokar.

This keeps near the coast, with a short branch to Trinkitat harbour.

## 4. Tokar—Kassala—Gallabat.

This line runs south-west via Jebel Adaribab to the point where the Sudan-Eritrean frontier cuts the Khor Dada, thence, following the frontier, through Maman to Kassala. Here it crosses the River Gash, and runs to Kashm el-Girba, where it crosses the Atbara, and so on to Gedaref. Thence through Doka to Gallabat, the terminus.

## 5. Gedaref—Abu Haraz (junction of the Rahad with the Blue Nile).

## 6. Gedaref—Mafaza.

## 7. Khartoum—Rejaf.

From Khartoum to El-Dueim there is a telegraph line on either bank of the White Nile, the right bank line continuing on from there southward. It passes through Renk to Melut, where it crosses the river, running on the left bank to Tonga, a few miles south of Taufikia, where a line branches north-west to Talodi. The main line follows the Bahr el-Zeraf for some distance, then strikes south-east, through Awoi and Kongor to Bor, where it rejoins the White Nile. It then continues down the right bank through Mongalla and Gondokoro to a point opposite Rejaf, where it crosses the river to Rejaf. (Nimule is connected by telegraph with Wadelai and Fajao in Uganda.)

## 8. Tonga to Talodi (see above).

## 9. Tombe—Wau—Meshra el-Rek.

From Tombe a line runs through Mvolo, Rumbek, and Tonj to Wau, whence a line branches north-east to Meshra el-Rek.

## 10. Sennar—Kosti.

A line runs north of the railway as far as Kosti, where it joins it to El-Obeid.

## 11. El-Obeid—El-Nahud.

Following a route, at first almost due west, then south-west.

## 12. El-Obeid—Bara—Jebel Arashkol.

This line follows a route, running north-east from Bara to Homra, then eastward to the White Nile at Jebel Arashkol.

## 13. Sennar—Karkoj—Roseires.

This line follows the left bank of the Blue Nile fairly closely, except for cutting across the bend made by the river near Singa.

In 1913 a survey was made for a proposed telegraph line between Bor and Taufikia via the Pibor and Akobo Posts and Nasser. Nasser and Gambella, as already stated, are connected with the Sudan Telegraph System by wireless.

## HARBOURS, ANCHORAGES, BEACONS

The only considerable harbours on the Sudan Red Sea coast are Port Sudan and Suakin; Trinkitat is a small port with room in its anchorage for small steamers only. There are, however, a great number of inlets and shallow bays, mostly blocked by reefs, and often with narrow entrance channels, in which sailing craft and gunboats or small steamers might find shelter. Great care is needed in navigation. A list of some of the more important ones will be given below.

**PORT SUDAN** (lat.  $19^{\circ} 36' N.$ , long.  $37^{\circ} 14' E.$ ). The limits of the harbour of Port Sudan, as defined by the Harbours and Shipping Ordinance of 1916, include :

(a) Within the coast line : the whole of the inlet formerly known as Mersa Sheikh el-Barghut up to high-water mark ; also the quay wall and so much of the customs enclosures as lies between the outer edge of the same and an imaginary line drawn parallel to it at a distance of five metres.

(b) Without the coast line : the whole of the piece of water bounded on the east by a line running north and south through the East Wingate and North Towartit beacons, and on the north and south by imaginary lines drawn due west to the coast from the said beacons.

The Admiralty chart and harbour plan 3492 is corrected up to date.

*Lights and Beacons.*—There is a lighthouse on the northern side of the entrance (for description, see p. 604). To north and south of the narrow entrance channel are fixed lights, at a height of 26 ft., visible for 6 miles: the former is green, the latter red. On the northern shore of the western arm of the harbour two iron framework towers act as leading beacons by day and show a red light at night; the front tower is painted in chocolate and white horizontal bands, that in the rear is chocolate only. They are visible from seaward through an arc of  $90^{\circ}$  and when in line bearing N.  $51\frac{1}{2}^{\circ}$  W. lead directly into the harbour. Two beacons stand on prominent points of the reef, one on each side of the channel outside the harbour. Both are iron standards 15 ft. high; the northern one has a triangle topmark and the southern one a black and white chequered disk topmark. A beacon similar to the last stands at the edge of the coast reef about 1 mile SSE.  $\frac{1}{4}$  E. of the lighthouse mentioned above.

*Entrance.*—The entrance is straight in a north-westerly direction between the fringing reefs, which are clearly visible. The railway bridge, the yellow chimney of the electric power station, 174 ft. high, and the water tower, 126 ft. high, are conspicuous landmarks when approaching. Vessels making the port can communicate by means of the international code of signals with the signal station which is erected 450 ft. to the north of the power station chimney; the approach of steamers is reported from this signal station. Vessels can enter or leave at any time, day or night. (For Pilotage, see below. For the Wireless Station, see p. 586.)

*Depths.*—The navigable entrance channel is from one to  $1\frac{1}{4}$  cables wide, with depths decreasing rapidly from 40 to 14 fathoms. At 4 cables above the tomb of Sheikh el-Barghut (see p. 720) it bifurcates. The western branch, ending in a mud flat which is overflowed at times, is about  $1\frac{1}{2}$  cables wide and less than 4 cables long; its depth decreases from 14 to  $3\frac{1}{2}$  fathoms. The north-western arm is a narrow creek  $2\frac{1}{2}$  miles long, one cable wide at its entrance and tapering



off to half that width a short distance up, but with deep and clear water for  $1\frac{1}{2}$  mile, the depths decreasing from 14 fathoms to 4. (The railway bridge crosses the north-western arm about 6 cables above the entrance.)

*Anchorage.*—The anchorage, about  $\frac{1}{2}$  mile long, is abreast of the north-western arm, with depths of 7 to 14 fathoms; it is protected from all winds, the NE. is the most prevalent. The tides are scarcely perceptible. It was much used by H.M. ships during the war; a floating dock is needed.

*Harbour Master.*—The port is under the control of a harbour master, who regulates the berths of vessels and other matters, in accordance with the Harbour and Shipping Ordinance of 1916.

*Quays.*—There are 5 berths, each 410 ft. long, with a depth of 30 ft. of water alongside; the quays are lighted by electricity and have four 2-ton and one 7-ton electric gantry cranes, and two 5-ton and four 1-ton electric capstans. There are also floating cranes for lifting weights of 60 tons and 15 tons. Two temporary quays (1916) can accommodate vessels 420 ft. in length. Railways run alongside the quays. At the north-east end of the main quays are the customs and other offices, coal dépôts, and shipping stores. The Eastern Telegraph Company's office is near the black beacon marked 'Cable',  $\frac{1}{2}$  cable south of the front leading light that indicates the submarine cable to Suakin.

*Coal.*—There are four electric coal transporters, capable of dealing with 300 tons of coal per hour, and one electric coal rehandling bridge plant at the coal berths at the end of the quays. About 56,000 tons are annually imported, and 22,000 tons kept in stock. There is storage for 2,000 tons of liquid fuel. (For Water-supply, see p. 719.)

*Dockyard.*—There is a dry dock, with a steam hauling slipway capable of taking vessels up to 800 tons, and workshops equipped with electrically-driven machinery for ship-repairing.

*Plant.*—In addition to the plant mentioned above, the harbour is fully provided with other necessities, such as tugs

and barges, buoys, gangways, pontoons, buckets, and the like, to the use of which the Government Departments have at all times a prior claim. The Railways Department provides the crews of the lighters and men to work the machinery, but the hirer provides the labour for handling the cargoes. There is a fixed scale of charges for the use of the plant, a tariff for boats, &c.

*Dues.*—These are all charged on Suez Canal tonnage; they include the following, among others: Quay dues,  $\frac{1}{4}$  per cent. (*ad val.*) imports,  $\frac{1}{8}$  per cent. exports. Port dues,  $2\frac{1}{2}$  m.ms. per ton inwards, same outward. Vessels in ballast or with passengers only,  $1\frac{1}{2}$  m.ms.; those merely calling for bunker coal or water are granted a reduction of 50 per cent. on the total dues. Accostage, 10 m.ms. per metre length per day. Tug for leaving quays, £E1.

*Pilotage.*—All vessels over 10 tons, except vessels of war, entering or leaving Port Sudan are liable to pilotage dues whether a pilot has been employed or not; vessels of war are required to pay them when employing pilots. The charge is £E1 500 m.ms. for vessels from 1 to 1,000 tons and £E2 for those over 1,000 tons. A reduction of one half the ordinary charge is allowed in respect of vessels carrying a regular mail service to or from the port, or steam coasting vessels merely calling for coal or water, without landing or embarking passengers, mails, or cargo. Within the harbour, no vessel may move from one berth to another, or otherwise manœuvre, without a pilot on board. Vessels which require pilots for leaving the port must apply to the port officer, and hoist the pilot flag at the fore.

Every vessel under weigh shall, when proceeding seaward, be kept to the south of mid-channel, and when proceeding inwards from sea, to the north of mid-channel, so that in either case such vessel shall with a port helm always be kept clear of any vessel proceeding in the opposite direction.

*Quarantine Station.*—This is to the south of the harbour.

*Steamer Service.*—Port Sudan is a port of call for British, Italian, and German steamers. There is a weekly mail

service by the Khedivial Line with Suez, and a fortnightly outward and homeward service by the Union Castle Company and British India Company together.

(For the town, see p. 719.)

**SUAKIN** (lat.  $19^{\circ} 6' 58''$  N., long.  $37^{\circ} 20'$  E.). By the Harbours and Shipping Ordinance of 1916, Suakin harbour is defined as the whole of the inlet leading to the town of Suakin lying west of a line drawn between the outermost channel beacons.

*Beacons.*—The entrance channel is marked by five substantial white stone beacons on the edges of the bordering reefs, three on the starboard hand, two on the port hand in entering. The former are painted white, and numbered 1, 3, and 5, the latter are chequered black and white, and numbered 2 and 4. Nos. 1, 4, and 5 are surmounted by a staff and are 19, 14, and 12 ft. high respectively; No. 2 is 17 ft. high, No. 3 is surmounted by a cross, and is 22 ft. high. The two outer beacons are 4 cables apart.

Well up the harbour, opposite Quarantine Island, are two red staff-and-triangle beacons, marking the edge of the reef. (For the beacons marking the cable, see below.)

*Entrance.*—The beacon-marked and best entrance is by the north-eastern passage, which should always be used by large vessels. Early morning is the best time for entering. The entrance channel is winding, but takes a general SW. direction; its length up to Quarantine Island is 2 miles, its least width, 180 yds. Strong and irregular currents make the southern approach difficult. The yellow stone condenser chimney, 105 ft. high, on Quarantine Island, is a conspicuous landmark when making the harbour. (For pilotage, see below.)

*Depths.*—In the entrance of the Khor the depth is 25 fathoms, gradually decreasing towards Quarantine Island, outside the fringing reef of which there are from 6 to 8 fathoms, with considerable space for anchoring.

*Anchorage.*—About twenty vessels can be accommodated without blocking the channel. Merchant vessels anchor in the

main channel, to north-east of the town, men-of-war in the north-west arm, to north and north-east of Quarantine Island. There is room for one small vessel in the narrow channel south-east of the town, which has a depth of  $2\frac{1}{2}$  to 4 fathoms. The north-west arm, in which the holding-ground is not good, is about 8 cables in length, with a depth in the outer part of 7 and 8 fathoms; here there are one or two mooring buoys off Quarantine Island. Farther up, the arm turns northward, and is obstructed by shoals, among which a narrow 4-fathoms channel leads to within 2 cables' length of its head. The south-west arm at  $3\frac{1}{2}$  cables within its entrance is again divided by Suakin Island, on which the town stands. Its width to this point is  $\frac{1}{2}$  cable, its depth, 6 to 8 fathoms. North of the town, the depth decreases to 4 fathoms; a narrow channel with a least depth of  $2\frac{1}{2}$  fathoms passes along its eastern side, opening out into a considerable but shallow basin south of the town, about 4 fathoms deep in part. In either arm during winter sterns should be well secured, as sharp night squalls from the mountains are not infrequent. There are slight single day tides.

*Harbour (Piers, Coal, &c.).*—There are three railway piers on the port hand in entering; the outer is the smallest, the two inner piers being available for large vessels. The harbour is now mainly used by native boats and small coasting vessels. A limited supply of coal can sometimes be obtained, but it is dear; it is embarked by means of lighters. There are no facilities for shipping repairs.

*Pilotage.*—Pilotage dues are not chargeable on vessels entering or leaving Suakin harbour unless a pilot is employed. A vessel leaving Suakin can obtain a pilot on giving the Port Officer, Port Sudan, 24 hours' notice in writing or by telegraph. Vessels proceeding direct from Suez to Suakin can be met outside Port Sudan harbour if notice of the time of the ship's expected arrival is telegraphed to the Port Officer there before leaving Suez.

*Quarantine establishment.*—Quarantine Island is no longer used as a quarantine station. The present establishment is

on the north side of the entrance nearly opposite the piers described above ; it is approached by a pier thrown over the reef, with a fumigating shed on it. The buildings and premises of the establishment are surrounded by high wire fencing.

Higher up on the same side of the harbour is the Christian cemetery, also enclosed with wire fencing and approached by a pier.

Quarantine Island has several piers, of which all but three are in a state of decay ; it is connected with the mainland on its western side by a causeway. Opposite the island, the edge of the reef where the two beacons stand is further marked by two small landing piers, where the deep water begins.

*Steamer Service.*—There is a fortnightly service by the Khedivial Mail Line with Suez, Jidda, Massawa, Hodeida, and Aden.

*Telegraph.*—Suakin is connected with Port Sudan by a submarine cable, which is laid across the harbour in a southerly direction from the cemetery, and is marked at each end by a beacon. (Vessels must not anchor on the line joining these beacons.) The Eastern Telegraph Company have a cable to Aden, Suez, Perim, and Obokh, and there is an Ottoman cable with Jidda.

(For the town, see p. 721.)

**TRINKITAT** (lat.  $18^{\circ} 40'$  N., long.  $37^{\circ} 44'$  E.). Trinkitat lies 70 miles south of Port Sudan, and is extensively used during the Tokar cotton season by native sailing craft taking cotton to Suakin and Port Sudan. The harbour is formed by an inlet the entrance to which is not easily distinguished ; a stone blockhouse on the SW. shore is a useful landmark.

*Beacons.*—There are two leading beacons consisting of two poles 120 yds. apart and  $16\frac{1}{2}$  ft. high, painted in black and white bands ; each is surmounted by a white triangle. They lead between the shoals, the fairway having a least depth of 24 ft. and width of  $\frac{1}{2}$  cable.

*Harbour.*—The harbour is open to the north-east ; its available width is about  $3\frac{1}{2}$  cables ; within the entrance it

extends 8 cables to south, has a general depth of 4 fathoms, and can accommodate 20 vessels of 18 to 21 ft. draught. The holding-ground is good. Outside the harbour there is good anchorage in about 6 fathoms under the shelter of the steep reef and sandbank known as Katat Kennasha.

*Telegraph.*—Trinkitat is in telephonic communication with Tokar, about 10 miles inland, and thence in telegraphic communication with Massawa (Eritrea) as well as with Kassala, Suakin, &c.

The following is a list of the more important small anchorages along the coast from north to south :

*Mersa Haleib* (lat.  $22^{\circ} 13' N.$ , long.  $36^{\circ} 40' E.$ ). Excellent harbour, with two anchorages, north and south, with depths of from about 14 to 5 fathoms. Difficult of access for sailing vessels during north-west winds. Entrance channel, running north and south, about 1 cable wide, 7 to 13 fathoms deep. Southern anchorage marked by white fort and blockhouse ; pier.

*Mersa Bela.* A small cove  $4\frac{1}{2}$  miles south-west of Cape Elba, with just room for a gunboat with short cable out. Anchorage may also be found among reefs between Elba reef and the shore, as among the reefs north of Haleib, e.g. Shab Abu Fendera and Sherm Alueda.

*Eeles Cove* (lat.  $21^{\circ} 48' N.$ , long.  $36^{\circ} 52' E.$ ). At the head of an opening in the reef, 1 mile long by about a cable broad, 8 to 12 fathoms deep. Anchorage in the cove in 7 to 8 fathoms,  $\frac{1}{2}$  mile from its head,  $1\frac{1}{2}$  cables wide ; swinging room for small craft only. Anchorage also in the northern bight, about same size as cove, in 10 fathoms.

*Sherm Abu Amara Farat* (N. point, lat.  $21^{\circ} 31' N.$ , long.  $33^{\circ} 33' E.$ ). Entrance channel to inlet, marked by hill Abu Hamama, is at first about 2 cables wide in a west direction, 15 to 13 fathoms deep ; in harbour, centre of channel is occupied by Middle shoal, with roomy inner anchorage beyond it, about 3 cables wide, 8 to 10 fathoms deep ; passage to this on east side of Middle shoal is widest and safest. But a more convenient anchorage is abreast of North bay, before

reaching shoal, in 12 fathoms, with clear width of 2 cables between shoals. Reefs visible if port entered before noon.

*Khor Dhu-l Lawa* (lat.  $21^{\circ} 26' N.$ , long.  $37^{\circ} 0' E.$ ). Extends about 2 miles inland, only 1 cable wide, and in one part only one-third of that navigable; entered by gap in coast reef, with depths of 18 to 11 fathoms. Anchorage for small steam or sailing vessel, but little space for swinging until  $1\frac{1}{2}$  mile in, and none for working.

*Khor Shinab* (lat.  $21^{\circ} 21' N.$ , long.  $37^{\circ} 3' E.$ ). Entered by narrow gap in coast reef, 12 to 14 fathoms deep. Extends about 4 miles inland. Channel at entrance upwards of 1 cable wide, 30 to 15 fathoms; sailing vessel may run in with fair wind, but no working room inside. Khor ends in three small but deep bights, to north, south, and west, Quoin Hill at the head of the last. Forenoon best time for entering, reefs scarcely discernible after; sunken rock, 6 miles from entrance, a danger. Best anchorage is well up the harbour, outer part being very narrow.

*Dongonab (Dokhana) Bay*. Extensive inlet enclosed by Ras Raweiya and reefs extending southward from it, name specially applied to small bay on west side of inlet. Good anchorage when once inside, but reefs and bar practically close bay to all but small vessels.

*Raweiya and Mohammed Gul Anchorages*. Raweiya Anchorage is the outer of two anchorages, of which the inner is called Mohammed Gul (lat.  $20^{\circ} 54' N.$ , long.  $37^{\circ} 10' E.$ ); they are formed and protected by a series of shoals, reefs, and islets, which extend eastward from the coast at about 3 miles north of Mohammed Gul for a distance of 3 miles, and then in a more southerly direction for  $3\frac{1}{2}$  miles. The northern entrance, between Mesharifa and Gad Mesharifa islets, is the best, but is available for small vessels only; it has a navigable channel about 2 cables broad and  $4\frac{1}{2}$  fathoms deep. Raweiya Anchorage is of considerable extent and well sheltered; Jebel Tariba and the high chimney of the Raweiya salt works are useful landmarks.

Vessels bound to the Raweiya and Mohammed Gul Anchor-

ages or to those inside Makawa Island have a choice of several channels, but none of those north of Makawa Island are available for large craft. The best of these channels is the northern one already mentioned, but it is intricate, and obstructed by numerous sunken dangers; mid-channel should be kept. The channel leading to the inner anchorage is marked on either side by two stone beacons, each 6 ft. high, and can be taken, with care, by a small steam-vessel. The southern and principal approach to these anchorages should only be used by vessels of moderate draught, the depths being irregular.

*Makawa (Mekwar) Island* (southern end; lat.  $20^{\circ} 44' N.$ , long.  $37^{\circ} 15' E.$ ). Rocky spit extends a mile off this, with anchorage in 12 fathoms on south-east side and in any depth on west side.

*Khor Ankifail* (lat.  $20^{\circ} 47' N.$ , long.  $37^{\circ} 10' E.$ ). Narrow break in the coast reef with good anchorage for *bagalas* (fair-sized, sea-going sailing craft).

*Dabadib (Tibadeb)*. Nine miles south of the last. Entrance channel between Teila Islands to south and mainland, 5 cables wide, 5 to 8 fathoms deep in mid-channel; anchorage is small, but close up inside point of reef is well protected from north winds.

*Teila Islands*. Under the westernmost of the three is an anchorage in irregular depths of 10 to 4 fathoms, protected against north winds.

*Salaka* (lat.  $20^{\circ} 27' N.$ , long.  $37^{\circ} 11' E.$ ). Small bay on west side of sandy spit, with anchorage of 9 or 10 fathoms; sunken rocks, insufficient protection from strong south winds. Two entrance channels, one between sandy spit and sunken rocks to south, the other, rather wider, between these rocks and shore reef south of them; least depth of 3 fathoms at entrance to both. Outside bay, indifferent anchorage on south side of reef of sandy spit; bad holding-ground, no shelter from south wind.

Several rock and sand anchorages may be found under lee of outer reefs south of this and Mersa Darur, e.g. off the south and south-east of Tella-Tella Seghir, and south of Kad Hogit.



*Mersa ar-Rakiya* (lat.  $20^{\circ} 12' N.$ , long.  $37^{\circ} 10' E.$ ). Small land-locked harbour 4 or 5 cables in extent, entrance blocked by coral islet reducing navigable width to about 30 yds.; depth 6 to 8 fathoms. Inside bay, coral heads protruding almost to surface make it unfit for anything but boats or small *dhow*s. Only anchorage is on east side of islet in entrance; space is  $\frac{1}{4}$  mile long, rather over 1 cable wide, 12 fathoms in mid-channel; good holding-ground. Only room for one, or possibly two vessels. Best approach is round south end of Shab Suadi, channel to north of it is not safe, though used by native craft from Jidda.

*Mersaijab (Fejer)* (lat.  $20^{\circ} 2' N.$ , long.  $37^{\circ} 12' E.$ ). On west side of inner channel to Port Sudan. Inlet 2 miles long, entered by channel about a cable wide, south of an islet; this tapers northward to a narrow, muddy creek, with obstructed and limited anchorage, suitable for very small vessels only. An outer anchorage in about 12 fathoms, well protected and suitable for short vessels, in centre of bay in north fringing reef outside harbour; south end of reef should be closely kept to avoid a dangerous invisible head.

*Mersa Arus*. Small harbour  $1\frac{1}{2}$  mile south of the last. Entrance channel only  $\frac{1}{2}$  cable wide in places, decreasing in depth from 9 to 2 fathoms; harbour itself has only from 7 to 8 ft. of water, so only fit for boats.

*Mersa Darur* (lat.  $19^{\circ} 50' N.$ , long.  $37^{\circ} 16' E.$ ). In inner channel leading to Port Sudan. Entered through fissure in coast reef,  $\frac{3}{4}$  cable wide, 4 fathoms deep; harbour has depths of from 4 ft. to  $2\frac{1}{2}$  fathoms over limited space, but head is silting up owing to débris brought down by Khor Arbat and Khor Darur, which empty here; available space, about  $\frac{1}{4}$  mile in extent with depths of  $1\frac{1}{2}$  to  $2\frac{1}{4}$  fathoms, affords good shelter for small craft. Stone landing-pier at east end of inner islet, connected by causeway with mainland. Outside anchorage, 6 to 7 fathoms, in channel between detached reef and islet south of entrance; little swinging room. Anchorage in 10 fathoms also to north of this detached reef, but exposed to prevalent north winds.

*Mersa Kihai* (lat.  $19^{\circ} 39'$  N., long.  $37^{\circ} 15'$  E.). Khor about  $2\frac{1}{2}$  miles long, 1 cable wide, 10 to 20 fathoms deep for first mile from entrance, ending in shallow bay 5 cables wide, with good shelter for boats, but too narrow at mouth and too shallow at head for larger craft. No anchorage off entrance.

Several breaks in coast reef in inner channel between Port Sudan and Suakin give shelter to boats and *dhow*s, e.g. Mersa Amid, Mersa Ata, Mersa Kuwai. Anchorage in 10 to 25 fathoms may also be had in almost any part between Ras Makdah and Ras Shakal inside the islands of the Suakin group, where the water is usually smooth.

South of Suakin, and approached by the southern channel to that port, there are the following :

*Mersa Haddhu*. Anchorage and landing for large boats and *dhow*s. Entrance only 50 yds. wide, least depth, 7 ft. A lagoon harbour is approached by Mersa Likak Hindi, 2 miles long, 3 to 6 ft. deep ; opening at north end.

*Mersa Sheikh Ibrahim* (lat.  $18^{\circ} 53'$  N., long.  $37^{\circ} 25'$  E.). Entrance channel  $\frac{1}{2}$  to 1 cable wide, depths 17 fathoms at mouth, 9 to 10 half-way in, 5 at inner end. Leads to anchorage  $4\frac{1}{2}$  to 6 fathoms deep,  $4\frac{1}{2}$  cables long by  $1\frac{1}{2}$  wide ; good holding-ground.

*Mersa Sheikh Sad*. Well-protected reef-harbour about 2 miles long, depths decreasing from  $4\frac{1}{2}$  fathoms to 6 or 7 ft. at head. No good landing-place, boats ground about 50 yds. from shore. Room for short vessel to lie at single anchor just inside entrance, farther in, stern anchor required. Entrance partly obstructed by shoals ; fringing reef on north side should be closely skirted.

*Mersa Makdah*. Capacious anchorage, 6 to 8 fathoms, in north and north-west part of harbour ; south part should be avoided owing to shoals. *Eagle Anchorage* at south-west in 5 fathoms ; good to south-east of beacon on Eagle Island.

*Akik Seghir* (lat.  $18^{\circ} 15'$  N., long.  $38^{\circ} 12'$  E.). Three islets at  $1\frac{1}{2}$  mile out from shore extend north and south and protect anchorage to east of inner one in from  $4\frac{3}{4}$  to 7 fathoms,  $\frac{1}{2}$  mile

from small landing jetty. To approach jetty between this islet and the shore, boats must cross bar with only one fathom over it.

*Khor Nauarat* (entrance, lat.  $18^{\circ} 15' N.$ , long.  $38^{\circ} 19' E.$ ). Entrance not difficult for small ships, in spite of absence of leading marks and need for rapid approach, owing to extensive shoals. Bay is 4 miles broad and extends 4 miles inland, but Bahdur Island occupies large space in centre. Not good anchorage for large ships, principally owing to difficulty of finding more than 26 ft. water in channel between Guban and Hajar Islands. This channel, the best, with about 5 fathoms on either side of fairway shoal; the other two are (1) between Hajar and Farajin Islands (with a bar, 2 to 3 fathoms), (2) between Ras Shakal and Guban (6 to 7 fathoms in entrance). Depths, in outer part of bay, 4 to 6 fathoms; in inner part, where vessels anchor south-west of Bahdur Island, 4 fathoms decreasing to 2 near mainland. Small native sailing vessels find channel between Hajar and Farajin convenient and time-saving when running southwards with north winds or northwards with south winds.

#### BEACONS

The beacons of Port Sudan, Suakin, and Trinkitat are described under those harbours.

The following beacons, from north to south, mark some of the many reefs, shoals, and headlands off the Sudan Red Sea coast; navigation is difficult, especially among the group of islands and reefs off Suakin.

*Dongonab (Dokhana Bay)*.—Abington reef (lat.  $20^{\circ} 53\frac{1}{2}' N.$ , long.  $37^{\circ} 26\frac{1}{2}' E.$ ). Iron trellis-work beacon, painted in brown and white horizontal bands, surmounted by a triangle, 27 ft. high.

*Mohammed Gul*.—Approach to inner anchorage. Two stone beacons, 6 ft. high, on either side of channel.

*Shab Rumi* (lat.  $19^{\circ} 56' N.$ , long.  $37^{\circ} 23' E.$ ).—Iron trellis-work beacon, painted in black and white horizontal bands, surmounted by black and white chequered disk, 12 ft. high, on atoll reef.

*Wingate Reefs*.—Two beacons of iron trellis-work, one on the eastern, the other on the southern point. The first is 27 ft. high, surmounted by a round cage; the second, 28 ft. high, with a diamond topmark.

*Towartit Elbow* (about 8 miles south of Port Sudan).—Iron chocolate-coloured standard, 15 ft. high, on outer edge of reef.

*North Towartit Reef*.—On the northern edge a white pyramidal beacon, 21 ft. high, surmounted by a red staff and triangle, 9 ft. high.

*Ras Abdallah (Hadarawip Spit)*.—Iron trellis-work beacon, surmounted by staff and triangle, painted chocolate, about 24 ft. above high water, marks  $2\frac{1}{4}$  fathoms patch nearly 1 mile from shore.

*Hind Kadam* (lat.  $19^{\circ} 23' N.$ , long.  $37^{\circ} 54' E.$ ).—Northernmost islet of Suakin group. Beacon, 40 ft. high, visible for about 12 miles, consists of black iron frame, surmounted by cage-work ball, on white pyramidal masonry base.

*South Jumna Shoal* (lat.  $19^{\circ} 11\frac{1}{2}' N.$ , long.  $37^{\circ} 31' E.$ ).—The beacon buoy marking this dangerous shoal was discontinued for some years, but a new one was placed there in 1916.

*Suakin—Southern Approach*.—The following beacons mark reefs here: Kad Hogit (16 miles west of Tella-Tella Seghir), white conical stone beacon 25 ft. high, surmounted by staff and ball, in the centre; Shab ul-Shubuk, stone beacon on south-east point; Sumar inlet, two small beacons on either side of entrance; Corner Reef, white masonry pillar beacon, surmounted by staff and cage, about 20 ft. high, near centre; Middle shoal (lat.  $18^{\circ} 55\frac{1}{2}' N.$ , long.  $37^{\circ} 32' E.$ ). Can buoy, painted red and white, with white disk on staff, to south of fairway. Liable to be washed away.

*Mersa Makdah*.—Shubuk beacon as above; Sumar beacon, close to western end of Sumar Island; Point beacon, 1 mile north-east,  $\frac{3}{4}$  east from Melita point; Eagle beacon, on outer edge of reef extending eastward from Eagle Island.

The beacons on Ras Shakal and Ras Istahi were reported in 1916 to have disappeared.

## LIGHTHOUSES

There are two lighthouses—one on Sanganeb Reef, 15 miles north-east of Port Sudan, the other on the north side of the harbour entrance at Port Sudan.

*Sanganeb Reef Lighthouse.*—About 100 yds. from the south end of the reef (lat.  $19^{\circ} 43' N.$ , long.  $37^{\circ} 26' E.$ ). An open framework tower 180 ft. high, painted brown, with the exception of the keeper's rooms and lantern, which are white. It exhibits a white flashing light, 165 ft. above high water and visible for 19 miles, with a period of 5 seconds, viz. flash,  $\frac{1}{2}$  second, eclipse,  $4\frac{1}{2}$  seconds.

*Port Sudan Lighthouse.*—An iron framework tower 63 ft. high, on the outer end of a coral pier. It exhibits an occulting light with a period of 10 seconds, visible for 14 miles. The light shows red sectors over the Wingate and Towartit reefs and a white sector over the fairway.

In addition to the lighthouse there are two leading lights in iron framework towers, 113 and 157 ft. high respectively, on the northern shore of the western arm of the harbour. They act as beacons by day, and at night show fixed red lights placed vertically and 20 ft. apart.

## CHAPTER XIII

### CLIMATE

General—Climatological data—Tables

#### GENERAL

FOR climatic purposes the country of the Sudan, which extends from north to south through a distance of about 1,200 miles, and has stations 800 miles apart from west to east, is divided into six regions, having from two to five stations in each division. The stations furnishing data for the purpose of this chapter are given on p. 606, together with their latitudes, longitudes, and altitudes, and certain information concerning the periods over which the observations are recorded.

#### *Temperature*

The position of the Sudan is essentially continental, and situated as it is in the high-pressure region of North Africa, it is swept by dry northerly winds with their corollary of heat and, so far as the northern portion of the territory is concerned, dryness, conditions that recall the Saharan region of lower Egypt.

North of latitude  $12^{\circ}$  the mean temperature, at its lowest in January, attains its maximum height in mid-May or early June, and gradually recedes as the year advances. South of latitude  $12^{\circ}$  the maximum occurs in March and April, when northerly winds and clear skies prevail, and the minimum, owing to the influence of the southerly monsoon and the attendant rainfall, is in some instances attained in July and August, while in others the temperature falls almost to its lowest point in those months, and then rises, only to fall again in October and November to the winter minimum in January.

Order of station.	Period.	Latitude		Longitude		Altitude. ft.	Observations.
		N.	E.	°	'		
<b>North Sudan, 16°-22° N. :</b>							
Wadi Halfa . . .	II 1900-12	21	55	31	19	420	Winds, 1901-12. Temperature, 1891-1912. Evaporation, 1905-12.
Merowe . . .	II 1905-12	18	29	31	50	836	
Atbara . . .	II 1902-12	17	40	33	58	1,161	Data for Berber from 1902 to 1906 included. Winds, 6-7 years. Evaporation, 1905-12.
<b>Mid Sudan, 10°-16° N. :</b>							
Khartoum (Gordon Coll.)	I 1908-12	15	37	32	33	1,280	{ Evaporation, 1905-12. Normals, 1900-12.
Khartoum (Hospital)	II 1900-10	15	37	32	33	1,256	{ Winds, 12 years.
Wad Medani . . .	II 1900-12	14	24	33	31	1,328	Winds, 1901-12. Temperature, 1902-12. Evaporation, 1905-12.
Duem . . .	II 1902-12	14	0	32	20	1,256	Evaporation, 1905-12.
Roseires . . .	II 1904-12	11	51	34	23	1,531	Evaporation from November 1905.
<b>South Sudan, 3°-10° N. :</b>							
Kodok . . .	II 1904-12	9	53	32	8	1,270	Wind, 4 years. Rain and cloud from 1904. Other elements from 1906.
Dolieb Hill . . .	III 1903-12	9	18	31	38	1,282	Winds at 8 a.m., 1904-6 and 1909-12.
Gambella . . .	III 1908-12	8	15	34	35	1,345	Evaporation, 1909-12. Rain from 1905.
Mongalla . . .	III 1903-12	5	11	31	47	1,440	Evaporation, 1906-12.
Nimule . . .	II 1904-13	3	39	32	10	2,034	Winds, 1906-13.
<b>Red Sea, 19°-21° N. :</b>							
Dongonab . . .	III 1908-12	21	6	37	8	16	Evaporation, 1908-12 (1912 only complete).
Port Sudan . . .	II 1905-12	19	37	37	13	20	Evaporation, 1906-12. Winds, 8 years.
Suakin . . .	III 1900-12	19	7	37	20	15	Winds, 1901-12. Temperature, 1890-1912. Evaporation, 1905-12.
<b>East Sudan, 12°-16° N. :</b>							
Kassala . . .	II 1900-12	15	28	36	24	1,668	Winds, 1901-12. Rainfall, 1901-12. Evaporation, 1906-12.
Gallabat . . .	II 1905-12	12	48	36	10	2,506	Winds, 1906-12. Rainfall, 1903-12. Evaporation, 1906-12.
<b>West Sudan, 7°-13° N. :</b>							
El-Obeid . . .	II 1901-12	13	11	30	14	1,919	Wind, 10 years. Evaporation, 1907-12.
Kadugli . . .	III 1910-12	11	2	29	45	1,650	
Kafia Kingi . . .	III 1910-12	9	22	24	18	1,956	Rainfall from 1906. Many lacunae.
Raga . . .	III 1909-12	8	15	25	35	—	Data fragmentary.
Wau . . .	II 1902-12	7	42	28	3	1,444	Normals are for 1904-12. Winds, 8 years. Evaporation, 6½ years.

It will be seen from the tables that follow that the whole region is one of high temperatures, in north Sudan a shade temperature of  $126.5^{\circ}$  F. having been recorded at Wadi Halfa in April and  $124^{\circ}$  F. at El-Obeid in February, and as an absence of cloud is another characteristic of the arid climate, the ground is heated to a high temperature by day, while rapid radiation at night brings about a very extensive range of temperature. At Wadi Halfa and El-Obeid the difference between the absolute maxima and minima recorded amounts to  $92.7^{\circ}$  F. in each instance, at Merowe to  $86.4^{\circ}$  F., and at Atbara and Dueim to over  $79^{\circ}$  F. At Mongalla ( $58.8^{\circ}$  F.), Raga ( $57.9^{\circ}$  F.), Nimule ( $57.2^{\circ}$  F.) and Wau ( $65^{\circ}$  F.) the range is considerably less, the variation of temperature throughout the year in the southern Sudan being comparatively small as the following table shows :

## MEAN TEMPERATURE

	<i>Yearly mean.</i>	<i>Mean of the maxima.</i>	<i>Difference from yearly mean.</i>	<i>Mean of the minima.</i>	<i>Difference from yearly mean.</i>	<i>Range.</i>
	$^{\circ}$ F.	$^{\circ}$ F.	$^{\circ}$ F.	$^{\circ}$ F.	$^{\circ}$ F.	$^{\circ}$ F.
N. Sudan .	80.5	91.7	+ 11.2	64.4	- 16.1	27.3
Mid-Sudan .	80.95	89.2	+ 8.25	71.9	- 9.05	17.3
S. Sudan .	79.3	84.85	+ 5.55	76.4	- 2.9	8.45

The mean monthly range of temperature in northern Sudan varies between  $38.5^{\circ}$  F. and  $61.1^{\circ}$  F. ; in mid and east Sudan the range is highest at Wad Medani in March,  $56.5^{\circ}$  F., and lowest at Roseires,  $28.6^{\circ}$  F., in July, and Gallabat,  $26.1^{\circ}$  F. in August. In south Sudan the greatest range,  $52.9^{\circ}$  F., at Gambeila, occurs in January, and the least,  $27.3^{\circ}$  F., at Kodok in August. On the Red Sea the temperature is more equable, the maximum range,  $41.4^{\circ}$  F., occurring at Dongonab in July, and the minimum,  $23.4^{\circ}$  F., at Suakin in November. In west Sudan the maximum range is  $59.4^{\circ}$  F. in February, at El-Obeid, lat.  $13^{\circ}$  N., the minimum,  $25.8^{\circ}$  F., in July, at Wau, lat.  $7^{\circ} 42'$ .



*Precipitation*

The rainfall of the Sudan is chiefly remarkable for its steep gradient, as is seen from the statement below, which shows that precipitation varies from  $41\frac{1}{2}$  in. per annum in south Sudan to practically nothing at Wadi Halfa and Merowe, or, to emphasize the characteristic to a more striking degree, 48 in. falls on an average at Gambeila, lat.  $8^{\circ}$ , and only one-tenth of that amount, 4.8 in., at Khartoum, about 500 miles to the north, the distance between Land's End and Inverness.

## MEAN ANNUAL RAINFALL

<i>Latitude N.</i>	<i>Inches.</i>
$22^{\circ}$ – $18^{\circ}$	0.028 (inland)
$18^{\circ}$ – $15\frac{1}{2}^{\circ}$	4.9 (coast)
$15\frac{1}{2}^{\circ}$ – $13^{\circ}$	7
$13^{\circ}$ – $9^{\circ}$	14
$9^{\circ}$ – $3^{\circ}$	31
	$41\frac{1}{2}$

Although rain, taking the country as a whole, falls in every month of the year to a greater or less extent, it is only from April to November that the amount registered is very material, and, apart from the Red Sea stations, where half the precipitation of the year is recorded in the autumn, from 52 to 75 per cent. of the annual rainfall is deposited in the three months June, July, and August, particularly the last-mentioned, when south and south-westerly air currents blow from the equatorial zone.

Precipitation in each of the six divisions is treated in detail in the pages that follow, but for the purpose of comparison a table is here given showing the rainfall by months and seasons in each division, and also the percentage of the total rainfall falling in each season.

It may here be mentioned that hail was recorded at Roseires on one day in October in the course of four years, and one fall of snow was recorded at Gallabat in the same month during the same period, but it cannot be said that the records of these and similar phenomena give the impression of completeness.

## MEAN RAINFALL BY MONTHS

Lat.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Year.
° °	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
North Sudan	0.00	0.00	0.00	0.00	0.05	0.05	0.07	0.34	0.66	0.21	0.03	0.01	1.42
Red Sea .	1.07	0.41	0.33	0.04	0.02	0.05	0.00	0.29	0.11	0.00	0.60	1.90	4.82
Mid-Sudan	0.00	0.00	0.02	0.09	0.25	0.90	1.80	4.63	4.83	3.07	0.77	0.07	16.43
East Sudan	0.00	0.00	0.01	0.12	0.12	0.71	2.25	5.27	5.35	2.92	0.90	0.22	17.87
West Sudan	0.00	0.00	0.13	0.29	1.08	3.40	4.80	6.70	7.70	5.82	2.56	0.20	32.68
South Sudan	0.28	0.22	0.55	1.24	2.51	4.56	5.00	5.76	7.15	4.77	3.76	1.99	37.79

## MEAN RAINFALL SEASONAL

	Winter.	Spring.	Summer.	Autumn.
	in.	in.	in.	in.
North Sudan	0.00	0.10	1.07	0.25
Red Sea .	1.81	0.11	0.40	2.50
Mid-Sudan	0.02	1.24	11.26	3.91
East Sudan	0.01	0.95	12.87	4.04
West Sudan	0.40	4.77	19.20	8.58
South Sudan	1.05	8.31	17.91	10.52

## PERCENTAGE OF TOTAL RAINFALL

	Winter.	Spring.	Summer.	Autumn.
	%	%	%	%
North Sudan	0	7	75	18
Red Sea .	38	2	8	52
Mid-Sudan	0.1	7	68.5	24
East Sudan	0.01	6	71	23
West Sudan	0.4	14.5	59	26
South Sudan	2.8	22	47.4	27.8

*Thunderstorms.*—The data respecting this phenomenon are not convincing, but it is apparent that thunderstorms are far from infrequent in the months of June, July, and August from the thirteenth parallel southwards. At Kassala twelve thunderstorms have been recorded in the month of July, eleven in August, and ten in June; at El-Obeid eighteen have been registered in the month of July, and at Wau nine have been registered in both March and April, months in which storms of this character are not usually prevalent.

### *Relative Humidity*

In that portion of the Sudan where the rainfall is sparse, the humidity is naturally low in view of the high temperature prevailing. On the sea-coast the mean relative humidity for latitudes  $19^{\circ}$  to  $21^{\circ}$  N. is as high as 62 per cent., as compared to  $72\frac{1}{2}$  per cent., for the mean of Alexandria and Port Said, lat.  $30^{\circ}$ – $32^{\circ}$  N., but the inland stations at similar latitudes,  $18^{\circ}$ – $22^{\circ}$  N., have the low relative humidity of 29 per cent., which represents the lowest percentage for the country. The following statement illustrates the fact that humidity increases gradually as the equatorial region is approached until the maximum is reached in the latitude of Mongalla and Wau :

	Latitude N.	Mean relative humidity.
		%
N. Sudan . . .	$22^{\circ}$ – $16^{\circ}$ (inland)	29
	(coast)	62
Mid-Sudan . . .	$16^{\circ}$ – $14^{\circ}$	38
" . . .	$14^{\circ}$ – $12^{\circ}$	42
" . . .	$12^{\circ}$ – $10^{\circ}$	$56\frac{1}{2}$
S. Sudan . . .	$10^{\circ}$ – $8^{\circ}$	$62\frac{1}{2}$
" . . .	$8^{\circ}$ – $5^{\circ}$	70

### *Evaporation*

The high temperature and low relative humidity of the Sudan together contribute to the high measure of evaporation that obtains all over the country, but particularly at the inland stations of the northern portion. In London evapora-

tion amounts to about 16 in. per annum, which is equivalent to about 64 per cent. of the rainfall; in north Sudan the rainfall is immaterial in its quantity, while evaporation, on the other hand, is of the highest importance, and aggregates as much as 234 in. per annum. At Atbara as much as  $1\frac{1}{2}$  in. in twenty-four hours has been recorded in April and May, while at Wadi Halfa over 28 in. have been registered in the month of June. It is interesting to note that at Bulawayo, which is almost as far below the Equator as Wadi Halfa is north thereof, the mean evaporation is little more than half that of the Egyptian station.

The mean daily evaporation for the entire year in various portions of the Sudan, which bears an inverse ratio to the relative humidity, varies between 0.64 in., equivalent to 233.6 in. per annum in the north, and 0.295 in., equivalent to 107.6 in. per annum in the south:

	<i>Latitude N.</i>	<i>Mean daily evaporation. in.</i>
N. Sudan (inland)	22°-16°	0.64
(coast)		0.332
Mid-Sudan	16°-14°	0.491
"	14°-11°	0.426
S. Sudan	11°-8°	0.385
"	8°-5°	0.295

### *Wind Direction*

In the months of January and February, with three exceptions furnished by Gambella, Gallabat, and Nimule, which is situated in the calm belt, and has a prevalent east wind of zephyr strength throughout the year, the direction of the prevailing wind is from the north-west to the north-east, but chiefly from the north. In March the wind at Gallabat, which has hitherto had a southerly tendency, veers to the north-west, while at Mongalla the predominating wind is from the east; apart from these stations the wind observations are uniformly northerly, due to a low-pressure area over Abyssinia and a portion of the Sudan. The April winds in that portion of the Sudan ranging from lat. 10° to lat. 22° continue to blow from

the north, but below lat.  $10^{\circ}$ , with the exception of Nimule and Kafia Kingi, concerning which only two years data, at 8 a.m., are available, the prevailing wind is from the south and south-west. During the course of May, when the low-pressure region moves farther north and east towards the Persian Gulf, the area of southerly winds extends as far north as Kassala,  $15^{\circ}$ , and by June, when the rainy season is at its height, southerly winds prevail everywhere with the exception of certain stations in north Sudan and at the Red Sea ports. At the sea-ports the north wind blows practically throughout the year except at Suakin, where the predominant wind is from the south in August. Throughout August a southerly wind blows practically all over the country, with a mean strength of 2 (scale 0-10), but by September, when summer conditions are waning and a low-pressure area is again approaching the Sudan, the wind veers to the north at the stations situated to the north of the 16th parallel, and during October this northerly tendency increases, with the result that the prevailing wind at fifteen out of the twenty-one stations dealt with is found to blow from the north quadrant.

The wind directions characteristic of January and February, that is to say, northerly everywhere saving at Gambeila, Gallabat, and Kadugli, are re-established in the course of November, and continue throughout December, by which date the Kadugli winds have fallen into line, and far into the spring.

In the Sudan the monsoon effect shows itself principally between the latitudes  $5^{\circ}$  to  $18^{\circ}$  N., as alternations of N. and S. winds in the dry and rainy seasons respectively. The S. winds prevailing from June to October are the S.E. trade winds of the Southern Hemisphere, becoming S. and SW. winds owing to the deflecting force of the earth's rotation and the low-pressure system over Arabia and Abyssinia. During the rest of the year the NE. trade winds blow down to lat.  $5^{\circ}$  N.

It is interesting to note that during the northern declination of the sun S. winds prevail, during the southerly declination N.

and NE. winds, but during this period southerly winds also may occur not infrequently northward to lat.  $7^{\circ} 42' N.$ , at Wau on the Jur, a westerly tributary of the Nile, where the lowest mean temperature occurs in August, and the course of temperature is that of the Southern Hemisphere.

### *Wind strength*

Mean wind strength in the Sudan is not excessive, but is by no means a negligible quantity. In east Sudan the mean strength of the year is about 2.2 (Beaufort Scale), but the wind records at seven Sudan ports on the Red Sea attain a mean for the year represented by 3.2 on the Beaufort Scale, the yearly mean of the twenty stations given in Table XXI. being 2.7, an average in excess of the yearly mean wind strength recorded at either Kew or Paris.

Of the twenty Sudan stations given in the table, seven have their highest mean wind strength occurring in the three summer months June, July, and August, six in the three winter months December to February, five in the spring months, and only two in the autumn. The period of least wind strength ranges from August to November inclusive, with September as the quietest month with a mean wind strength of 2.4.

The table on p. 614 shows in which months the highest and lowest mean strengths occur in the Sudan.

An analysis of six years (1907-12) of the mean monthly wind strength (scale 0-10) at twenty Sudan stations shows that the highest monthly means were reached at two places on the coast and two in western Sudan, namely, Kafia Kingi, 5.4 in April 1912, Dongonab, 5.2 in January 1908, Suakin, 5.2 in June 1909, El-Obeid, 5.1 in June 1907, and Wau, 5.1 in December 1907. The lowest monthly mean wind strengths are recorded at Gallabat, 0.2 in November 1907, and Dolieb Hill, Gambeila, and Suakin, 0.4 in September 1912, June 1909, and September 1912. An examination of the following table, giving the highest and lowest mean monthly wind strengths, 1907-12, shows that the greatest range occurred at Suakin on

No. of stations.	Highest.												Lowest.											
	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
North Sudan	—	—	—	—	1	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	1
Mid-Sudan	—	1	—	—	—	—	2	1	—	—	—	—	—	—	—	—	—	—	—	1	—	3	—	1
South Sudan	1	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Red Sea	—	—	2	1	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
East Sudan	—	—	—	—	1	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
West Sudna	2	—	—	—	1	1	1	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	3	1	2	2	2	1	3	3	1	1	1	0												
	Winter. 6						Spring. 5						Summer. 7						Autumn. 2					
													Lowest.											
North Sudan	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mid-Sudan	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
South Sudan	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Red Sea	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
East Sudan	1	—	—	—	1½	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
West Sudan	1	0	1	0	2½	1	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Winter. 2			Spring. 3½						Summer. 3						Autumn. 11½								

the coast, Gambeila and Kodok in south Sudan, and Wau in west Sudan :

*Mean Monthly Wind Strength (Scale 0-10), 1907-12*

		<i>Highest.</i>		<i>Lowest.</i>	<i>Range.</i>
Wadi Halfa . . .	3-0	Jan. 1911 June 1909	0-9	in 1908 Jan.	2-1
Merowe . . .	4-1	April 1907	1-5	July 1910 Nov. 1907	2-6
Atbara . . .	2-5	July 1912	1-0	Oct. 1908-9	1-5
Khartoum . . .	3-8	Aug. 1911	0-8	Oct. 1907	3-0
Wad Medani . . .	3-4	Dec. 1912	1-4	Oct. 1908	2-0
Dueim . . .	4-4	April 1911	1-1	Aug. 1907	3-3
Roseires . . .	2-6	June, July 1907	0-5	Nov. 1908	2-1
Kodok, 4 yrs. . .	4-9	June 1908	0-7	Nov. 1910	4-2
Dolieb Hill, 4 yrs. . .	3-2	Dec. 1911	0-4	Sept. 1912	2-8
Gambeila, 4 yrs. . .	4-8	Nov. 1909	0-4	June 1909	4-4
Mongalla . . .	2-9	Jan. 1907	0-7	April 1908	2-2
Dongonab . . .	(5-2)	Jan. 1908	1-4	July 1911	3-8
Port Sudan . . .	4-9	Mar. 1907	1-0	Aug. 1908	3-9
Suakin . . .	5-2	Jan. 1909	0-4	Sept. 1912	4-8
Kassala . . .	3-2	July 1907	1-0	Dec. 1907	2-2
Gallabat . . .	4-0	May 1912	0-2	Nov. 1907	3-8
El-Obeid . . .	5-1	June 1907	1-2	July 1912	3-9
Kadugli, 3 yrs. . .	2-9	Dec. 1910	1-9	Oct. 1910 April 1911	1-0
Kafia Kingi, 3 yrs. . .	5-4	April 1912	2-0	June 1910	3-4
Wau . . .	5-1	Dec. 1907	0-9	Feb. 1910	4-2

With respect to winds of gale strength, 7-10 on the scale 0-10 (see Table XXIII), analysis of the winds at the seven stations shows that consistency is by no means a characteristic. An entire year, for example, may pass without a wind of strength 7 being recorded at hours of observation at a certain station, while the following year the same observatory may record as many as eighty winds of gale strength in the twelve months.

From November to March the winds of gale strength are northerly in character, in April they blow from an easterly direction, in May and June they range from the south-east to the south-west, in July and August strong south-east winds prevail, while September and October is a transitional period, the winds of gale strength being neither pronounceably north nor south.



## CLIMATOLOGICAL DATA

## 1. NORTHERN SUDAN

*Wadi Halfa*

Lat.  $21^{\circ} 55' \text{ N.}$ , long.  $31^{\circ} 19' \text{ E.}$ , alt. 420 ft.

The mean temperature at Wadi Halfa is comparatively low : the maximum of  $89.2^{\circ} \text{ F.}$  in June and July being  $4^{\circ} \text{ F.}$  below that of Merowe, and the minimum,  $58.3^{\circ} \text{ F.}$  in January,  $8.6^{\circ} \text{ F.}$  below the Merowe mean for the same month. The mean of the year,  $76.6^{\circ} \text{ F.}$ , is the lowest for any place in the Sudan at which observations three times a day are taken. The mean daily maximum of  $106.5^{\circ} \text{ F.}$  in June, and the mean monthly maximum of  $114.0^{\circ} \text{ F.}$  in May, are nothing out of the common, but the absolute maximum of  $126.5^{\circ} \text{ F.}$  reached in April 1903, and a temperature of  $118.9^{\circ} \text{ F.}$  observed in June 1899–1900, show how intensely hot it can be at this station. The mean daily minimum of  $46.4^{\circ} \text{ F.}$  in January, the mean monthly minimum of  $35.6^{\circ} \text{ F.}$ , also in January, and the absolute minimum of  $33.8^{\circ} \text{ F.}$ , both in January and February, indicate very cool nights with great radiation of heat into the dry air. It naturally follows from these premises that the mean range of temperature is very considerable, and it is found in point of fact that it amounts to as much as  $61.1^{\circ} \text{ F.}$  for February,  $60.0^{\circ} \text{ F.}$  in March, and is never less than the August figure,  $43.9^{\circ} \text{ F.}$ , in any month of the year.

No *rainfall* has been recorded at Wadi Halfa during twelve years' observations, but the *relative humidity* is comparatively high, ranging from 49 per cent. in December to 20 per cent. in May and averaging 33 per cent. for the year. The mean *vapour pressure* which is highest (10.5 mm.) in September and has a minimum of 5.2 mm. in February, has a mean for the year of 7.6 mm. which is fairly high. These facts show that there is no direct relation between the amount of moisture in the air and the amount of rain precipitated. Mean daily *evaporation* is greatest in June when it amounts to 0.846 in. and least in December when it averages 0.352 in. The mean for

the year is 0.619 in. The maximum evaporation noted in 24 hours is 1.323 mm. in June. The amount of *cloud* recorded is small. The maximum 1.2 (scale 0-10) occurs in February: in the summer the cloud values are nominal, while the mean is only 0.6 for the year or about one-seventh of that recorded at Mongalla.

*Wind strength* averages 2.1 for the year (scale 0-10) and is greatest in the autumn and spring: in March and April two gales per month may be expected. The following table shows that north to east winds predominate all the year and that calms are not infrequent in winter and summer.

	<i>N. + NE. + E.</i>	<i>W. + NW.</i>	<i>Calm.</i>
Winter	47 + 29 + 3 = 79%	3 + 4 = 7%	11%
Spring	44 + 31 + 4 = 79%	3 + 4 = 7%	8%
Summer	44 + 23 + 4 = 71%	3 + 9 = 12%	12%
Autumn	53 + 27 + 4 = 84%	2 + 7 = 9%	5%

### *Merowe*

Lat. 18° 29' N., long. 31° 50' E., alt. 836 ft.

The mean temperature of Merowe in June, 93.2° F., is the highest mean temperature registered at any station in the Sudan; the lowest mean temperature, that of January, 66.9° F., is on the other hand comparatively low, Wadi Halfa and El-Obeid alone furnishing lower records. The mean daily maximum of 109.8° F. in June, the very high monthly maximum of 116.1° F., also in June, and the absolute maximum temperature of 119.7° F. in July, are among the highest temperatures registered in the Sudan, and show that the neighbourhood of Merowe is perhaps the hottest region in the country. The mean daily minimum temperature of 52.9° F., the mean monthly minimum of 46° F. and the absolute minimum of 33.3° F., all occurring in January, show that rapid cooling due to radiation takes place at night in that month of northerly winds and cloudless skies. The mean monthly range is rather smaller than at the other stations, the maximum, 53.3° F., occurring in March and the minimum, 39.6° F., in August. The *rainfall* is nominal. In September,

October, and November occasional showers fall, but in the other months precipitation is non-existent. The maximum rainfall recorded for any month was 0.22 in. in September and the maximum in any year is rather less than 0.25 in. The average number of rain-days is one in two years. *Relative humidity* is low, varying between 31 per cent. in December and 12 per cent. in May and June, the mean of the year being 21 per cent. *Vapour pressure* has a maximum of 9.3 mm. in August and a minimum of 3.0 mm. in March, the average being 5.8 mm. From these particulars it will be gathered that this station is remarkable for its lack of moisture; it is in point of fact the driest in the Sudan. *Evaporation*, as might be expected, is considerable, an average mean daily evaporation of 0.64 in. being recorded for the year, while the daily mean throughout the month of June 1905 was double that amount.

The prevalence of northerly *winds* throughout the year is to a great extent the cause of the absence of rain, as even in summer the S.-W. winds are not dominant, as the following table indicates.

	N. + NE. + NW.	S. + SW. + W.	Calm.
Winter .	28 + 46 + 18 = 92%	Nominal	4%
Spring .	29 + 43 + 14 = 86%	1 + 2 + 2 = 5%	4%
Summer .	18 + 18 + 19 = 55%	7 + 15 + 9 = 31%	5%
Autumn .	20 + 39 + 22 = 81%	2 + 6 + 3 = 11%	3%

The *wind strength* is rather greater than usual in this part of the world, a maximum of 2.52 (scale 0-10) being attained in spring and an average of 2.2 for the year.

#### *Atbara (and Berber)*

Lat. 17° 40' N., long. 33° 58' E., alt. 1,161 ft.

The extremes of *temperature* at Atbara are higher and lower than at Khartoum two degrees farther south; the first because it is farther north and there is less rain and cloud to keep the temperature down and the second owing to the greater nocturnal radiation.

The mean temperature is at its highest, 92.7° F., in June, and at its lowest, 68° F., in January; the mean for the year,

82·4° F., coincides with the mean for Merowe situated nearly a degree farther north. The mean daily maximum, the mean monthly maximum, and the absolute maximum temperatures have greatest values of 110·5° F., 114·3° F., and 116·6° F., respectively, and all three are attributes of the climate in June, though the last mentioned, a temperature of 116·6° F., is not confined to that month and has been also reached in May and August. The mean daily minimum temperature is at its lowest, 55·6° F., in January, the mean monthly and absolute minima are also at their lowest in the same month with values 45·5° F. and 37·4° F. respectively. The mean monthly range of temperature is higher than at Khartoum, and varies from 54·8° F., in April, to 38·5° F., in September.

The *rainfall* at Atbara, amounting to 4·2 in. for the year with a maximum of just under 2 in. in August, is about one-eighth of that of Roseires four hundred miles farther south. The greatest fall registered in one month occurred in August, when 6·9 in. fell ; for a complete year 9·5 in. is the maximum so far observed, while 2·1 in. is the greatest downpour in twenty-four hours. Rain days on the average number 9, with 2 to 3 in July and August and practically none from October to May.

*Relative humidity* has a lower maximum (42 per cent.) than any other station, except Merowe, in the Sudan and is less than the minimum mean relative humidity at either Wau or Gambeila ; the minimum is about the same as at Khartoum, 21 per cent., and occurs in April, while the mean for the year, 34 per cent., is slightly higher than at Khartoum.

As in the case of relative humidity *vapour pressure* has a minimum of 6·1 mm. in April, and a maximum of 13·9 mm. in August. The mean for the year of 9·6 is practically the same as at Khartoum. *Evaporation* is slightly higher at Atbara than in mid-Sudan, a mean daily maximum of 0·78 in. being an accompaniment of the climate in May and a minimum of 0·51 in. that of December ; the yearly mean of 0·64 in., as in the case of the mean temperature, coincides with that of Merowe. The maximum evaporation of 1·535 in. in 24 hours

has been noted in May, while in one year the mean daily evaporation for the entire month of April was as high as 1.02 in.

The amount of *cloud* is small ; a maximum of 2.15 occurs in August, about 2 in July and September, and less or equal to 1 in the remaining months, the mean of the year being as low as 1.

*Thunderstorms* are rare, there are only 1-2 in the year ; others that occur generally happen in August and September.

The winds at Berber, owing to local conditions, are more frequent than at Atbara, therefore tables for each place are subjoined ; elsewhere, in Table XXIV, the records have been amalgamated.

It is to be noted in the case of Berber that north to east winds blow throughout the year, even in summer ; at Atbara these winds, though more frequent in the winter and spring, are less prevalent than at Berber in the summer and autumn.

<i>Atbara.</i>	<i>N. + NE. + E.</i>	<i>S. + SW. + W.</i>	<i>Calm.</i>
Winter .	63+26+2=91 %		0.5 % 3.3 %
Spring .	51+26+4=81 %		2 % 9.6 %
Summer .	13+4+1=18 %	14.5+27.5+16.3=58 %	19.1 %
Autumn .	26+21+12=59 %	7.6+7.8+6.1=21 %	14.6 %
<i>Berber.</i>	<i>N. + NE. + E.</i>	<i>S. + SW. + W.</i>	<i>Calm.</i>
Winter .	71.5+4.4+1.2=77 %	5 %	0.2 %
Spring .	57.8+9.7+8.7=76 %	10 %	—
Summer .	31.6+3.8+4.7=40 %	15+13+21=49 %	—
Autumn .	39.3+10.7+13.5=64 %	8+4+8=20 %	—

The mean wind strength at Atbara, 1.5 for the year, is less than that of any of the twenty Sudan stations with the exception of Roseires and Mongalla.

## II. MID-SUDAN

The temperature of mid-Sudan is slightly higher than that of either south or north Sudan, but the chief climatic interest attaches to the rainfall which, except near the Abyssinian frontier, shows a very rapid diminution when compared with the rainfall of the region of latitude 5°-10°.

*Khartoum*

Lat.  $15^{\circ} 37' N.$ , long.  $32^{\circ} 33' E.$ , alt. 1,280 ft.

The climate of Khartoum with its high day and low early morning temperatures, dryness of air and small rainfall, is decidedly Saharan in character. The mean temperature has a June maximum of  $91.5^{\circ} F.$  and a January minimum of  $70.7^{\circ} F.$ , while the mean for the year,  $83.1^{\circ} F.$ , is  $2^{\circ}$  higher than at Wad Medani  $1^{\circ} 13'$  farther south. The mean daily maximum temperature is at its highest in May,  $107.9^{\circ} F.$ , the mean monthly maximum,  $112.6^{\circ} F.$ , is at its highest the following month, while the absolute maximum of  $116.6^{\circ} F.$  was recorded in July. The rise of temperature from the January minimum is here progressive as the summer advances, and as it is not mitigated by clouds and humidity, as is the case farther south, there is no drop in temperature during the rainy months. The mean daily, monthly, and absolute minima,  $58.4^{\circ} F.$ ,  $47.8^{\circ} F.$ , and  $41.4^{\circ} F.$  respectively, are all registered in January. The range of temperature is not abnormal, a maximum of  $52.7^{\circ} F.$  occurring in March and a minimum of  $37.5^{\circ} F.$  in August.

The *rainfall* at Khartoum is very small, only 4.85 in. falling on an average in the year with a maximum of under 2 in. for August. Eight months of the year are practically rainless. The heaviest monthly fall recorded, 7.3 in., occurred in August, and the heaviest yearly rainfall registered is no more than 8.9 in. A fall of 2.4 in. in 24 hours has been registered in July. There are on the average 14 rain days of which 4-5 are in July and the same number in August.

*Relative humidity* varies between 55 per cent. in August and 20 per cent. in March and April, and has a yearly average of 33 per cent. or less than half that of Wau eight degrees farther south. *Vapour pressure* likewise has its minimum value, 5.3 mm., in March and its maximum, 15.9 mm., in August; the mean for the year is 9.5 mm. or practically the same as at Atbara. The mean daily *evaporation* at Khartoum, which has a maximum of 0.63 in. in April, and a mean for the

year of 0.48 in., is less than that of other stations in the same district; but on the other hand the range between the above maximum and the January daily mean, 0.388 in., the lowest in the year, is also much less than that of other mid-Sudan stations. The cloud value is not great: a maximum of 4.5 is expected in July and a minimum of about 0.5 in December and January. The mean of the year, 2, is higher than at other mid-Sudan stations with the exception of Roseires nearly 4° farther south.

Days with *thunderstorms* average 6 for the year and mostly occur from July to September.

The distribution of *winds* can be easily grasped. Northerly winds predominate for three-quarters of the year and in the winter form 96 per cent. of the total observed. In the summer only are south winds in excess. Calms are 2 per cent. in winter and increase progressively to 12 per cent. in autumn.

	<i>N. + NE. + NW.</i>	<i>S. + SW. + W.</i>	<i>Calm.</i>
Winter	66 + 26 + 4 = 96 %		2 %
Spring	35 + 29 + 9 = 73 %	4 + 3 + 1 = 8 %	9 %
Summer	3 + 3 + 4 = 10 %	29 + 37 + 8 = 74 %	7 %
Autumn	31 + 15 + 5 = 51 %	12 + 12 + 4 = 28 %	12 %

The mean wind strength for the year is 2.2; it is highest in July, 2.77, and lowest in October, 1.7. In June and July there are in each month 1 or 2 days when the wind attains gale force.

### *Wad Medani*

Lat. 14° 24' N., long. 33° 31' E., alt. 1,337 ft.

Wad Medani, which is situated on the lower Blue Nile, has a climate typical of the plains of the Sudan, that is to say a high temperature with a great range owing to the rapid radiation of heat at night, and a moderate rainfall. The mean temperature of Wad Medani varies between 89.8° F. in May and 71.6° F. in January; but the rise and fall is by no means regular, for owing to the rainy season the temperature shows an abrupt fall after June, and remains comparatively low until October, when a secondary maximum of 84.6° F.

is attained, after which date it falls to its minimum. The mean daily maximum is least in January,  $93.2^{\circ}$  F., greatest in May  $108.3^{\circ}$  F., and has a secondary maximum of  $102.7^{\circ}$  F. in October. The mean monthly maximum has a least value of  $100.4^{\circ}$  F. in December, maxima of  $113.4^{\circ}$  F. in April and May, and a secondary October maximum of  $107.6^{\circ}$  F. Absolute maxima of  $117.5^{\circ}$  F. were recorded in March and April. The highest temperatures will be found much the same as at Dueim, but minimum temperatures are not as low. The mean daily minimum temperature is at its lowest,  $59.7^{\circ}$  F., in January, the lowest mean monthly minimum,  $49.3^{\circ}$  F., occurs in the same month, while the absolute minimum registered was  $44.6^{\circ}$  F. in February. The range of temperature is greatest,  $56.5^{\circ}$  F., in March and least,  $37.8^{\circ}$  F., in August and coincides fairly closely with that at Dueim. The mean rainfall at Wad Medani is 15.33 in. for the year, nearly all of which falls between June and September, the maximum rainfall, 4.9 in., occurring in July. The greatest monthly fall recorded was 11.4 in. in August and the greatest amount registered in any year was 28.965 in. A maximum downpour in 24 hours of 3.585 in. was registered in August 1909. Rain days average 33 per annum with a mean maximum of 9 in August and an absolute maximum of 12 in the same month.

*Relative humidity* is lowest, 16 per cent., in April, highest, 62 per cent., in August, and averages 37 per cent. for the year. *Vapour pressure*, which is at its lowest in March, 4.7 mm., and at its highest in August, 16.6 mm., has a mean for the year of 10.1 mm., which is rather lower than at Dueim, and follows the course of the dry and wet season. The value of *cloud* (scale 0–10), less than 1 from November to March, has a maximum of 3.9 in July and an average of 3.7 from July to September.

*Evaporation* is about the same as at Dueim; the highest monthly mean, 0.742 in. per diem, is formed in April, the lowest monthly mean, 0.27 in. per diem, occurs in August, while the mean of the year is 0.514 in. The high maximum



daily evaporation of 1.007 in. has been registered for the month of April in which month 1.535 in. has on occasion been observed in 24 hours.

The *winds* are the same as in other parts of the mid-Sudan. North to east, and some west winds, blow in the winter, but no south winds. A time of transition occurs in spring. South to west winds are predominant in summer and in the autumn wind frequency is about equally distributed in the quadrants north to east and south to west. Calms are few.

	N. + NE. + E.			SE. + S. + SW.			W. + NW.		Calms.
Winter	49	28	4 = 81%	0	0	0.1 = 0.1%	9	8 = 17%	1 %
Spring	39	16	7 = 62%	1	7	4 = 12 %	10	10 = 20%	1 %
Summer	7	1	7 = 15%	5	35	29 = 69 %	13	2 = 15%	2 %
Autumn	24	11	10 = 45%	5.5	20	10 = 35.5%	13	6 = 19%	0.5%

### *El-Dueim*

Lat. 14° 0' N., long. 32° 20' E., alt. 1,257 ft.

The maximum mean *temperature* at Dueim is 89.4° F. in May, the temperature then falls during the rainy season but reaches a secondary maximum of 84.9° F. in October, when the rains have ceased ; it then falls steadily to its minimum value of 70.5° F. in January. The mean daily maximum temperature similarly reaches its greatest value 105.1° F. in April, and attains a secondary maximum of 101.7° F. in October after which it falls to 90.7° F. for January. The mean monthly maximum temperature which is at its highest, 112.5° F., in April has a secondary maximum in October of 107.2° F., after which date it falls month by month to its lowest value of 98.8° F. in December. An absolute maximum temperature of 117.5° F. was registered in September and November in 1904 and 1902 respectively, but as the mean monthly maximum data for those months indicate these readings are quite abnormal. It is well to repeat that here (lat. 14° N.) and as far north as Merowe (lat. 18° 29' N.), beyond which the climate is practically rainless, the drop of temperature, coincident with the summer rains, is strongly marked. Farther north the temperature steadily increases

as the summer advances and the maximum falls in July or, on the Mediterranean coast, in August.

The lowest mean daily minimum temperature,  $56.8^{\circ}$  F., the lowest mean monthly minimum temperature,  $46.6^{\circ}$  F., and the absolute minimum temperature,  $38.2^{\circ}$  F., are all attributes of the climatological conditions prevailing in January and show that rapid cooling of the atmosphere at night is beginning to be caused by the dryness of the air.

The mean annual *rainfall* at Dueim is only 11.556 in., of which about 9.5 in. fall from July to September, July with 4.063 in. being the rainiest month. The heaviest fall recorded in any month was 8.583 in. in August, the heaviest for the year 23.856 in. The heaviest rainfall recorded in 24 hours was 3.071 in. in August. The mean number of rain days is small and amounts on an average to 22.5, of which 19 occur during the period July to September, and rather more than 3 in May, June, and October, leaving the rest of the year practically rainless.

The minimum *relative humidity* which after the dry season is as low as 16 per cent. in April, averages 64 per cent. for the rainy season and 38 per cent. for the year. Similarly the *vapour pressure* is lowest in March, 4.9 mm., averages 17.4 mm. for the rainy season and 10.8 mm. for the year.

The minimum *cloud* value of 0.1 is recorded in January, and a value of under 0.5 from November to April, from 1-2 in May, June, and October, an average value from 3 to 4 during the rainy season and a mean value for the year of 1.6.

*Evaporation* is rather high, the mean daily evaporation varying between 0.747 in. in March and 0.278 in. in August. The highest mean daily evaporation for one month is recorded in April and amounted to 0.781 in., which is only 0.006 in. below the maximum evaporation recorded for 24 hours during the period 1906-12, a maximum, by the way, that has been attained on one day in ten out of the twelve months of the year.

From November to March the *winds* are almost entirely north and north-west; April marks a transition period with

variable winds but northerly still prevailing. In May southerly and westerly winds appear, which blow almost exclusively from June to September; in October there is another transition period and north winds begin again. The mean wind strength is moderate, the maximum being 3 in January, the minimum 1·87 in October, and the mean for the year 2·37, which is rather higher than that of Kew. Calms are rare in winter and not frequent at other seasons.

	<i>N. + NE. + NW.</i>	<i>SE. + S. + SW.</i>	<i>Calm.</i>
Winter .	72+8+19 = 99 %	0+0·1+0·2 = 0·3 %	0·7 %
Spring .	36+9+13 = 58 %	3+ 6+ 5 = 14 %	5 %
Summer .	1·5+1+ 2 = 4·5 %	14+ 45+ 24 = 83 %	5 %
Autumn .	38+6+ 9 = 53 %	8+ 22+ 9 = 39 %	6 %

### *Roseires*

Lat. 11° 51' N., long. 34° 23' E., alt. 1,531 ft.

This station, which is situated on the Blue Nile not far from the Abyssinian frontier, has a mean temperature having a minimum, 74·8° F., both in January and August; its maximum temperature of 86·0° F. occurs in April and is 7·4° F. higher than the mean for the year. A mean daily maximum temperature of 104·9° F. occurs in April, and a mean monthly maximum of 109·4° F. in the same month; the absolute maximum temperature of 112·6° F. was, however, recorded in March; all these temperatures are lower than those of the other stations in mid-Sudan, the explanation being found in the altitude and easterly position of the place. The mean daily minimum temperature of 59·9° F. and the lowest mean monthly temperature of 50·5° F. both occur in January, while the absolute minimum temperature of 45·5° F. was also registered in that month. The mean monthly range is greatest in December, 54·2° F., and least in July, 28·6° F.

The *rainfall*, due to its easterly position, is the heaviest of any station in mid-Sudan. The mean fall is 33·86 in. with a maximum mean fall of 9·21 in. in August. The heavy rains fall between June and September, during which four months

84 per cent. of the total precipitation falls; the winter months are practically rainless. The greatest fall recorded for any month was 14.5 in. in August 1908, in which year the total aggregated 35 in., the largest aggregate recorded in 8 years. The greatest downpour registered in 24 hours amounted to 3.07 in., and fell in the month of August. The number of rain days averages 71 with a maximum of 17 in August.

*Relative humidity* is at its lowest in February, 27.5 per cent., and highest in August, 83.5 per cent., but from April to August there is a monthly rise of from 10 per cent. to 22 per cent., which is followed by a lower rate of diminution to the minimum. Similarly the *vapour pressure* has a minimum value of 8.2 mm. in March and then increases by positive increments month by month to the maximum of 18.2 mm. in August and September, after which it diminishes in a similar way to the minimum.

*Cloud* is not great, a mean minimum of 0.5 being registered in January and December and a mean maximum of 4.8 in August, while the yearly mean is no more than 2.3.

*Evaporation* at Roseires is less than at other stations in mid-Sudan; thus the maximum of 0.634 in. of mean evaporation in March is less than the maxima at either Dueim or Wad Medani, and the minimum of 0.157 in. in August is 0.211 in. less than the mean minimum recorded at Khartoum. The mean of 0.395 in. for the year is 0.123 in. less than the mean of the three remaining stations of the mid-Sudan. The maximum mean daily evaporation recorded for any month is 0.665 in. in March, in which month on one occasion 0.996 in. was evaporated in the course of 24 hours. It will be noticed from the tables that April and May are the hottest months, the usual summer increase of temperature being checked during the rainy season by the formation of more cloud with its corollary of less sun. As is normal in these parts northerly winds are dominant in winter, southerly and westerly winds dispute their sway in spring and are predominant in summer and autumn, but in autumn the northerly winds increase in

frequency and blow in the ratio 1 : 2 as compared with the south and west winds, as the following table indicates :

	<i>NW. + N. + NE.</i>		<i>S. + SW. + W.</i>		<i>Calm.</i>
Winter	31.2+	45+2.5=79%	3.3+	1.4+ 9.9=15%	4.6%
Spring	13.3+	24.9+1.9=40%	24.3+	10.7+10.7=46%	11.6%
Summer	2.1+	2.0+3.1=7%	47.1+	25.5+9.0=82%	2.8%
Autumn	10.7+	10.6+4.4=26%	27.5+	19.4+6.4=53%	10.3%

### III. SOUTHERN SUDAN

A characteristic and extraordinarily interesting feature of the meteorology of this region lies in the fact that the meteorological Equator appears to be established five degrees north of the geographical Equator. Here, it is found, southerly winds are frequent throughout the year and the yearly sequence of temperature is that of the southern hemisphere. Mean relative humidity, 38 per cent. from December to February, 78 per cent. from July to August, and cloudiness, 4.3 from December to February, and 6.6 from July to August, also agree with the phenomena expected in places of southern latitude. With regard to temperature it is found that in place of northern hemisphere conditions prevailing, that is to say with the minimum mean temperature recorded in December or January and the maximum in July or August, in latitude 5° N. the maximum mean temperature occurs in March (86° F.) and the minimum in August (77.7° F.). It is indeed not until the latitude, 9° 18' N., of Doleib Hilla at the junction of the Sobat and White Nile is reached that the conditions of the northern hemisphere begin.

The equatorial rain and calm belt has a mean position of lat. 1° N., where there is continuous rainfall with maxima in April or May and in November. North of this region the summer rains of the southern Sudan set in early in April and gradually extend northward to the valley of the White Nile and to the high tableland of Abyssinia. In this district the rainfall has a mean of 42.6 in. annually, the heaviest rainfall, averaging 17 in. and 16 in. respectively, occurring in April and May. The driest months in this neighbourhood

are from December to February and the average number of rain days about 140 per annum.

During the prevalence of southerly winds precipitation takes the form of heavy thunderstorms of short duration which are attended with great precipitation and are accompanied by winds of gale force. These storms diminish in intensity from south to north.

### *Kodok*

Lat.  $9^{\circ} 53' N.$ , long.  $32^{\circ} 8' E.$ , alt. 1,270 ft.

The mean *temperature*,  $78.9^{\circ} F.$ , of Kodok, which is situated on a flat tableland overlooking the White Nile, is the lowest of the southern Sudan stations ; the mean maximum temperature,  $84.9^{\circ} F.$ , occurs both in March and April, the mean minimum,  $74.8^{\circ} F.$ , in July, the sub-equatorial conditions being still apparent. The mean daily maximum is at its highest,  $101.6^{\circ} F.$ , in March and at its lowest,  $87.4^{\circ} F.$ , in July, the mean for the year being  $94.4^{\circ} F.$ , the same as Gambeila, which is one and a half degrees nearer the Equator. A mean monthly maximum of  $107.1^{\circ} F.$  is recorded for April, in which month an absolute maximum temperature of  $109.4^{\circ} F.$  has been observed.

The mean daily minimum temperature is lowest in December, when it averages  $62.6^{\circ} F.$ , and is  $5^{\circ} F.$  less than the mean for the year. The lowest mean monthly minimum,  $54.5^{\circ} F.$ , occurs in January, but the absolute minimum recorded at this station was registered in June 1909, when the thermometer sank to  $49.5^{\circ} F.$  ; the following month, July 1909, a minimum of  $50^{\circ} F.$  was recorded on two days, but these examples of low temperature are notable exceptions to the usual conditions obtaining at this station. The range of temperature at Kodok is not excessive, a maximum of  $47.2^{\circ} F.$  occurring in January and a minimum of  $27.3 F.$  in August.

As this is the most northerly station in southern Sudan the *rainfall*, as might be expected, is lower than at places nearer the Equator, the mean for the year being no more than 29.3 in., which is still quite adequate. Most of the rain falls from May

to October, the greatest mean amount in any month being just under 6 in. in July. A maximum monthly fall of 9.134 in. has been registered in June, and a maximum of 36.3 in. for the year. A downpour of 3.268 in. in 24 hours has been noted in August and in June. Rain days are 64 in the year with a maximum for the month of 13 in July. January and December are rainless. The dryness during the period Dec.-March is emphasized by the low *relative humidity*, which has an average of 34 per cent. for these months. In the summer relative humidity is high with an average of 84 per cent. for the period July to September. *Vapour pressure*, which is only 6.9 mm. in January, attains a maximum of 19 mm. in August and September. The mean for the year is 12.8 mm. as compared with 17.1 mm. at Mongalla. *Cloud* values are low in the dry months with a minimum of 0.9 for December and January. From May to September the cloud value exceeds 4 and reaches a maximum of 6 in July. Mean daily evaporation is very great in the dry months with maxima of 0.78 in. in January and February and a minimum of 0.16 in. in August. A mean maximum daily evaporation has been recorded as high as 1.06 in. for the month of January, 1.04 in. for the month of February, and 1.00 in. for the month of March, while a twenty-four hours' record exists showing that 1.69 in. of water has been evaporated in one day in February.

In winter the N. and NE. *winds* comprise 88 per cent. of the observations; in spring winds from those directions amount to 41 per cent. of the whole, and a like percentage come from the S. and SW. In summer N. and NE. winds drop to 7 per cent. and S. and SW. winds rise to 59 per cent., while in autumn the winds are more varied and comprise 35 per cent. N. and NE., 28 per cent. S. and SW., 11 per cent. SE., and 6 per cent. NW. Calms are few and range from 2.4 per cent. in winter to 9 per cent. in the summer with an average for the year of rather more than 5 per cent. It is seen that there is nothing abnormal in the course of the winds and that N. and NE. winds are prevalent in the driest and S. and SW. winds in the wet months.

*Doleib Hilla*

Lat.  $9^{\circ} 18' N.$ , long.  $31^{\circ} 38' E.$ , alt. 1,282 ft.

At this station, situated at the junction of the Sobat river and the White Nile, the climatic conditions of the northern hemisphere begin.

The highest mean temperature,  $87.4^{\circ} F.$ , falls in April, the lowest,  $77.7^{\circ} F.$ , in December; the mean for the year is  $81.2^{\circ} F.$ , or about one degree of temperature for its one degree of higher latitude over that of Gambeila. In April also the high mean daily maximum temperature of  $104^{\circ} F.$  is attained, a temperature that is about  $8^{\circ} F.$  above the mean for the year. The mean daily minimum for the year is  $68.4^{\circ} F.$ , or  $6.2^{\circ} F.$  above the mean for the month of December. Mean monthly and absolute maxima of  $110.8^{\circ} F.$  and  $116.6^{\circ} F.$  have been recorded in March, temperatures that show a marked increase on the records at more southerly stations. The mean daily minimum temperature is at its lowest,  $62.2^{\circ} F.$ , in December;  $54^{\circ} F.$  in January is the lowest mean monthly minimum, while the lowest temperature recorded,  $48.2^{\circ} F.$ , has been observed both in January and February. The greatest range of temperature,  $51.1^{\circ} F.$ , occurs in January, the least difference between the mean monthly maximum and minimum temperatures,  $29.3^{\circ} F.$ , is an attribute of August. Although only one degree of latitude separates Doleib Hilla from Gambeila the diminution of *precipitation* amounts to about 17 in. in the year, the mean total at Doleib Hilla being 31.2 in. January and December are rainless months at this station and most of the rain falls in the six months from May to October, July and August being the months of greatest rainfall with 6.9 in. and 7.5 in. respectively. The heaviest fall in any month was 11.26 in. in August, the heaviest aggregate for any year 37.37 in.; the maximum rainfall in 24 hours, 2.5 in., was registered in July.

As might be expected from its more northerly situation, the number of rain days is considerably less than at stations at lower latitudes, the total being 62 in the year or about



60 per cent. of those at Gambeila and about 70 per cent. of those at Mongalla. Mean *relative humidity* is high in the summer (maximum 86 per cent. in August) but falls to 31 per cent. in March with an average of 34 per cent. for the four months December to March. Similarly *vapour pressure* from 19.7 mm. in September and October falls to 7.9 mm. in February. There is a great diminution, as compared with Gambeila, of *cloud* in this drier climate; the maximum, in July, is only 2.9, the minimum, in January, is 0.6, and the average from November to February 0.7.

From November to March N. and NE. *winds* are predominant: in the wet season, from April to October, southerly winds prevail, the S. wind being dominant. Calms, rare in winter, are fairly frequent at other times.

	N. + NE.	SE. + S. + SW.	Calm.
Winter	68+ 18 = 86%	1.5+ 3.6+ 0.8 = 5.9%	4%
Spring	18+ 14 = 32%	10+ 25+ 10 = 45%	12%
Summer	2.5+ 4.5 = 7%	14+ 35+ 11 = 60%	14%
Autumn	18+ 11 = 29%	9+ 15+ 4 = 28%	20%

### Gambeila

Lat. 8° 15' N., long. 34° 35' E., alt. 1,345 ft.

The mean *temperature* is greatest in April, 84.2° F., least in September, 77.4° F., and has a mean for the year of 80.2° F. The hottest months are February, March, and April, with a mean temperature of 83.8° F., and the coolest September and December (77.5° F.). The mean temperature and the mean daily maximum, which is 101.2° F. in March, show a distinct increase, in the latter instance amounting to 3° F. over that of Mongalla. The mean monthly maximum temperature, which is also highest in March, 106.0° F., and is about 6° F. higher than the mean for the year, is about normal, but the absolute maximum temperature, 107.6° F., both in March and April, is comparatively low. The mean daily minimum temperature, 60.1° F., in December and the mean for the year, 66.1° F., represent the minima so far as the stations available in the southern Sudan are concerned.

The same statement holds for the mean monthly minimum of  $50.4^{\circ}$  F. in January, which is  $9^{\circ}$  F., and the mean for the year of  $54.7^{\circ}$  F., which is  $11^{\circ}$  F., below similar data for Mongalla. The absolute minimum recorded is  $46.8^{\circ}$  F., in January, compared with  $51.8^{\circ}$  F. at Mongalla. As might be expected, the range of temperature is high, the mean for the year being  $40^{\circ}$  F.; the maximum of  $52.9^{\circ}$  F. occurs in January and the minimum of  $31^{\circ}$  F. in June and July.

The *rainfall* for the year amounts on an average to 48.4 in., by far the heaviest amount of precipitation recorded at any of the stations in the Sudan. The maximum mean fall in any month is nearly 11 in. in August, the minimum, precipitation in the winter months being nominal, occurs in January. The greatest fall recorded in any month is 15.3 in. in August; a maximum of 5 in. in 24 hours has been recorded in the same month, while the greatest fall in any year is 62 in. The number of rain days is very high and averages 105 per annum; the months with the maximum number of rain days are June and August, both of which average 16.

The mean *relative humidity*, with a maximum of 80.5 per cent. in August, a minimum of 47.5 per cent. in February and March and a mean of 65 per cent. for the year, is still comparatively high in the winter months, a phenomenon it has in common with the vapour pressure, which varies from 17.9 mm. in August to 12.1 mm. in February.

The humidity of the air has a direct bearing upon the foundation of *cloud*, which at Gambella attains a maximum of 5.3 (scale 0-10) for June, and has a value of nearly 2 in the dry months, values which rapidly diminish in more northerly latitudes. Mean daily *evaporation* varies between 0.495 in. in March and 0.137 in. in July. The maximum mean daily evaporation recorded in any month was 0.52 in. in March and April. The situation of Gambella on the Sobat, more than 300 miles from the White Nile, explains the very exceptional nature of its *winds*, which being mainly southerly throughout the year influence the precipitation. The proximity of the station to Abyssinia, where there is an area of low

pressure in the winter, is also responsible for the prevalence, shown in the following table, of the SE. winds in winter.

	<i>SE. + S. + SW;</i>			<i>W.</i>	<i>Calm.</i>
Winter	36.2+	6.9+	9.6 = 52.7%	15%	13%
Spring	27.8+	6.2+	12.9 = 46.9%	13.3%	16.5%
Summer	25.4+	7.1+	7.5 = 40 %	8.7%	26.1%
Autumn	40.0+	11.2+	11.6 = 62.8%	8+7.7 = 15.7% (W. + NW.)	3.6%

The diminution of calm days in autumn and winter is an obvious characteristic of the winds of this station.

### *Mongalla*

Lat. 5° 11' N., long. 31° 47' E., alt. 1,460 ft.

The mean temperature for the year at this station is 79° F., with a mean daily maximum of 98.8° F. and mean daily minimum of 66.4° F. in January. The hottest months are January, February, March, and April, with a mean temperature of 81.3° F.; the coolest months are July and August with a mean temperature of 75.7° F. The hottest month is March, with a mean temperature of 82.9° F., but, as already stated, the highest mean daily maximum, 98.8° F., occurs in January. The coolest months, July and August, have a mean daily maximum temperature of 87.4° F. and 88° F. respectively, or nearly 6° F. below the mean maximum for the year (93.2° F.). The mean daily minimum temperature, 69.1° F. for the year, varies between 66.4° F. in January and 72.3° F. in April. The absolute maximum temperature recorded, 110.3° F. in January, is about 6° F. higher than the mean monthly maximum for that month, while the absolute minimum, 51.8° F. in February, is about 10° F. below that month's mean monthly minimum. The mean range is greatest in January, 44.6° F., and least in July, 28.1° F. The mean *relative humidity* during the first 3 months of the year is no more than 56 per cent., but in July and August it averages 85 or about 13 per cent. higher than the mean percentage for the year. The *vapour pressure* of Mongalla, as in southern Sudan generally, is high and varies between 14.1 mm. in January to 19.1 mm. in June. The *mean*

*rainfall* is 37·6 in. in the year, of which 6·24 in. fall, on an average, in August, and 4·8 in. in October. The driest month is January with 0·14 in.; in fact the precipitation from December to February, taking one year with another, is only nominal, but rain to the extent of 3·7 in. has been recorded in February and 1·18 in. in December. The mean number of rain days is 89, of which 12–13 occur in August; more than half the year's total is recorded in the four months May to August. The maximum monthly rainfall of 11·5 in. and the maximum in 24 hours, 3·5 in., were recorded in May. *Cloud* is least in January with a mean of 2·7, a maximum of 5·3 and a minimum of 1·2, and greatest in July and August with a mean of 5·2 and a maximum of 8·0.

The *mean daily evaporation* is greatest in January, 0·53 in., and least in August, 0·12 in.: it has averaged as much as 0·79 in. for the month of February and as little as 0·093 in. for the month of July. The maximum amount recorded in one day at Mongalla was 0·984 in. in the month of February, and the minimum amount recorded in twenty-four hours, 0·02 in., both in February and October. Northerly *winds* gain predominance in December and attain their maxima in January and February. In March southerly winds begin to take their place and increase in number to June, when they in turn decrease gradually, reaching their minima in December and January.

The following table gives numerical data :

	<i>N. + NE. + E.</i>	<i>S. + SW. + W.</i>	<i>NW.</i>	<i>Calm.</i>
Winter . . .	48 %	15 %	4 %	30 %
Spring . . .	31 %	28 %	3 %	32 %
Summer . . .	26 %	34 %	3·5 %	28 %
Autumn . . .	40 %	22 %	2 %	27 %

Comparison with other stations in South Sudan shows the percentage of calms to be unusually great.

#### IV. RED SEA STATIONS

Owing to its position the Red Sea develops two specially predominant winds—the north-west and the south-east. In

the northerly part, up to lat.  $19^{\circ}$  N., north and north-west winds prevail, then comes a region, lat.  $14^{\circ}$ – $16^{\circ}$  N., with variable winds where there is a region of minimum pressure : in the southerly parts down to Aden, south-east and east winds are dominant. From June to August the north-west wind blows at sea, but the position of the coastal Sudan stations with a mountainous background causes extensive deviation to the north-east, and other alterations as the wind seasonal tables will show.

### *Dongonab*

Lat.  $21^{\circ} 6' \text{ N.}$ , long.  $37^{\circ} 8' \text{ E.}$ , alt. 16 ft.

The mean temperature, which averages  $79.6^{\circ} \text{ F.}$  for the year, is highest in August,  $89.2^{\circ} \text{ F.}$ , and lowest in January,  $70.0^{\circ} \text{ F.}$  The mean daily maximum and mean monthly maximum are greatest in July with  $100.6^{\circ} \text{ F.}$  and  $112.1^{\circ} \text{ F.}$  respectively, while an absolute maximum of  $114.6^{\circ} \text{ F.}$  has been recorded in August. The mean daily, monthly, and absolute minima all occur or were recorded in January and the data  $62.8^{\circ} \text{ F.}$ ,  $50.7^{\circ} \text{ F.}$ , and  $45.3^{\circ} \text{ F.}$  indicate, in conjunction with the maxima figures, cool winter nights. At Dongonab the greatest range is in July with  $41.4^{\circ} \text{ F.}$ , the least in February with  $27^{\circ} \text{ F.}$

The *rainfall* is exceedingly small, the mean for the year being 1.3 in. and the mean greatest fall in a month, that of December, rather less than half an inch. The greatest fall for a single month was 1.89 in. and occurred in October ; the greatest amount for any single year was 3.5 in. The great fall recorded in 24 hours was 1.58 in. in October. There are on the average only 5–6 rain days in the year, of which 1 falls in October and 2–3 in December. November has one rain day every alternate year. It is found that *relative humidity* and *vapour pressure* are remarkably high for the Sudan Red Sea coast. Comparing this fact with the small rainfall, it is seen that the precipitation is not in a direct ratio to the amount of moisture in the air. Relative humidity is

greatest in January, 74 per cent., and least in June with 48 per cent.; the mean for the year is 63 per cent. Vapour pressure attains a maximum of 20·7 mm. in July and October and a minimum of 14·6 mm. in January, the mean for the year being 17·7 mm. Mean daily *evaporation* (0·583 in.) is greatest in June, but a maximum mean daily evaporation of 0·655 in. has been recorded for the month of May. *Cloud* value is moderately low, and has a mean of 1·5 for the year; a maximum of 3·2 occurs in December and a minimum of 0·4 for June.

*Wind* strength varies between 2 and 3 throughout the year, and has an average of 2·5, with a maximum of 3·1 in March and a minimum of 2·0 in August. The prevailing winds, as will be seen from the following tables, are in the quadrant north-east to north-west throughout the year, which fact accounts for the very small rainfall.

	<i>NE. + N. + NW.</i>	<i>SE. + S. + SW.</i>	<i>Calm.</i>
Winter	22 + 34 + 21 = 77 %	5 + 2 + 0 = 7 %	7 %
Spring	22 + 37 + 10 = 69 %	10 + 3 + 0 = 13 %	11 %
Summer	30 + 29 + 8 = 67 %	3 + 2 + 2 = 7 %	17 %
Autumn	26 + 36 + 13 = 75 %	5 + 3 + 1 = 9 %	10 %

### *Port Sudan*

Lat. 19° 37' N., long. 37° 13' E., alt. 20 ft.

The mean *temperature* of Port Sudan, 81·9° F. for the year, is highest in August with 92·1° F. and least in January with 73·0° F. The highest mean daily maximum temperature, 105·3° F. in July, the highest mean monthly maximum 113·4° F. in July, and an absolute maximum temperature of 117·5° F. in the same month show a marked increase on similar data at Dongonab. The lowest mean daily minimum temperature, 62·8° F., the lowest mean monthly minimum, 55·9° F., and the absolute minimum, 50·0° F., all occur, or were recorded, in the month of January and also show an increase of temperature as compared with similar data for stations farther south. The mean monthly range of temperature varies between 40·7° F. in September and 25·3° F. in December.

*Rainfall* is small, the mean of the year being only 5 in. The greatest mean fall, 2·12 in., occurs in November, in which month a maximum fall of 4·13 in. has been observed. The greatest aggregate rainfall for any year is 10·7 in., and the greatest downpour registered in 24 hours was 2·32 in. one day in November. There are on an average 15 rain days in the year, mostly from October to January, 5–6 of which are due in November. Mean *relative humidity* varies between 70 per cent. in November and 46 per cent. in August, and has a yearly mean of 60 per cent. *Vapour pressure* is highest with 21·4 mm. in October and least with 14·8 mm. in February. The yearly mean of 17·5 mm. is considerably more than that of inland stations of approximate latitude. *Evaporation* has its greatest mean daily value in July when it reaches 0·494 in., the mean of the year being 0·337 in. The maximum mean daily evaporation for the entire month, 0·62 in., was recorded in July and the maximum evaporation in 24 hours of 0·847 in. was observed in both June and July. *Cloud* is greatest from November to February when it has an average of 3·8 and is least in May and June (0·9). The mean for the year of 2·3 is intermediate, as Port Sudan is geographically, between the means for Dongonab and Suakin. *Wind* force attains its maximum of 3·2 in February; the minimum of 2·0 occurs in May, the mean for the year being 2·47. The prevailing wind is north-east all through the year.

	N. + NE. + E.	SE. + S. + SW.	Calm.
Winter	23 + 56 + 4 = 83 %	1·8 + 0·6 + 0·5 = 2·9 %	1 %
Spring	17 + 54 + 7 = 78 %	6·5 + 1·1 + 0·7 = 8·3 %	4 %
Summer	15 + 31 + 12 = 58 %	13 + 3 + 5 = 21 %	4 %
Autumn	21 + 47 + 11 = 79 %	6 + 1 + 2 = 9 %	2 %

### Suakin

Lat. 19° 7' N., long. 37° 20' E., alt. 15 ft.

The *temperature* of Suakin is the highest of the Red Sea stations; the mean temperature reaches a maximum in August of 94·5° F. and is never lower during the year than the January mean of 73·4° F. Such data as a mean daily

maximum temperature of  $107.1^{\circ}$  F. in July, a mean monthly maximum temperature of  $115.7^{\circ}$  F. in July, and an absolute maximum of  $118.9^{\circ}$  F. in July, clearly indicate that the heat at Suakin is peculiarly trying and it is in point of fact almost on a par with that of Khartoum, the station with the highest yearly mean temperature in the Sudan. The mean daily minimum temperature of  $67.1^{\circ}$  F., the mean monthly minimum temperature of  $58.6^{\circ}$  F., and an absolute minimum of  $50^{\circ}$  F., all recorded in January, show that a cold night as judged by British standards is unknown. The range of temperature, as might be expected from the above data, is not great and varies between  $39.6^{\circ}$  F. in June and  $23.4^{\circ}$  F. in November.

The *rainfall* of Suakin is slightly higher than that of the two other Sudan Red Sea ports and averages 8.4 in. for the year, but it is still very moderate in amount. The heaviest mean monthly fall occurs in November and aggregates 3.338 in., the heaviest fall in any month, 9.795 in., and the greatest downpour in 24 hours, 5.2 in., also happened in the same month. The greatest amount of rain falling in any year was 14.45 in. The mean number of rain days is 19, of which about 6 fall in November and 13.6 in the three months November to January. *Relative humidity* is highest with 74 per cent. in March, and lowest with 46 per cent. in July; the mean for the year is 64 per cent. *Vapour pressure* is highest in October, 21.5 mm., and lowest in February, 15.5 mm., while the mean of the year is 18.7 mm. The mean daily *evaporation* is greatest in July with 0.498 in. and least in October with 0.172 in. As at Port Sudan, a maximum evaporation of 0.847 in. in 24 hours has been noted in August. *Winds* blow throughout the year mostly from the quadrant north-west to north-east, the north wind predominating. Westerly winds are a moderate, but constant, factor throughout the year.

	NW. + N. + NE.	SE. + S. + SW.	W.	Calm.
Winter .	28 + 37 + 10 = 75 %	1 %	15 %	1 %
Spring .	23 + 38 + 16 = 77 %	3 %	7 %	5 %
Summer .	13 + 21 + 15 = 49 %	3 + 5 + 12 = 20 %	17 %	3 %
Autumn .	16 + 32 + 18 = 66 %	2 + 3 + 3 = 8 %	13 %	5 %



## V. EASTERN SUDAN

Eastern Sudan may be defined as a region with typical monsoon changes. In the winter north and north-east winds prevail, in the summer south and south-west. The changes to new conditions are slow in the spring, very quick in autumn. It is unfortunate that the character of the winds is affected by local conditions at the only two stations available. Gallabat lies in the foothills leading to the Abyssinian plateau and is, therefore, in a very sheltered position, while Kassala has a great mountain which shelters it from the winds from the east and south-east.

*Kassala*

Lat.  $15^{\circ} 28'$ , long.  $36^{\circ} 24'$ , alt. 1,666 ft.

The mean *temperature* of Kassala varies between  $90.5^{\circ}$  F. in May and  $73.9^{\circ}$  F. in January, with a mean for the year of  $82.4^{\circ}$  F., the same as at Atbara and Merowe. The mean daily maximum temperature is highest in May,  $105.6^{\circ}$  F., and is  $7.6^{\circ}$  F. higher than the yearly average; the mean monthly maximum also attains its highest temperature,  $110.1^{\circ}$  F., in the same month, while an absolute maximum of  $112.1^{\circ}$  F. has been reached both in April and May. The mean daily, monthly, and absolute minima are all at their lowest in January; their values,  $59.7^{\circ}$  F.,  $48.6^{\circ}$  F., and  $42.8^{\circ}$  F. respectively, indicate that the nights are fairly cool in winter, but less so than in more arid parts of the land. The range of temperature is at its greatest in March,  $52.7^{\circ}$  F., and does not go below the August range of  $32.2^{\circ}$  F. The mean *rainfall* of Kassala is moderate, only 12.214 in. for the year, with a maximum of 3.94 in. in August. The greatest downpour in any month was 9.23 in. in August, the greatest for any year 15.833 in.; the maximum rainfall in 24 hours, 3.27 in., was attained in September. The mean number of rain days is 31 per annum, 27 of which occur in the four months June to September. Mean *relative humidity* at Kassala is greatest in August with 64 per cent., and least in April with 27 per cent., while the

mean for the year is 44 per cent., almost coinciding with that in Gallabat. *Vapour pressure* varies between 16.6 mm. of August and 9.4 mm. in January, the mean for the year being 12.2 mm. The maximum mean daily evaporation of 0.592 in., about the same as Gallabat, occurs in April and the minimum, 0.266 in., in August; the mean for the year amounts to 0.41 in., equivalent to a yearly aggregate of 150 in. *Cloud* values in July and August reaches the high average of 5.8, but for the winter months the mean is about 1, and for the year 2.5. Fourteen *thunderstorms* on an average may be expected in the year between June and October, but twenty-nine have on occasion been recorded in three months in one year. *Wind* strength is moderate, the mean for the year being 1.8 and the maximum, in July, 2.4. Gales are rare, but an occasional wind of gale strength from the south quadrant is observed during the summer months. Wind directions follow the usual course unless special local conditions interfere.

	<i>N. + NE. + E.</i>	<i>SE. + S. + SW.</i>	<i>Calm.</i>
Winter .	44 + 25 + 9 = 78 %	4 + 5 + 1 = 10 %	8 %
Spring .	30 + 14 + 7 = 51 %	6 + 21 + 4 = 31 %	4 %
Summer .	1 + 0 + 2 = 3 %	5 + 70 + 16 = 91 %	1 %
Autumn .	16 + 11 + 8 = 35 %	11 + 37 + 7 = 55 %	3 %

### Gallabat

Lat. 12° 48' N., long. 36° 10' E., alt. 2,506 ft.

The mean temperature of Gallabat is highest in April with 85.3° F., and lowest in August with 72.7° F., the mean of the year, 78.1° F., being four degrees less than that of Kassala, though less than three degrees of latitude separate the towns. It is interesting to note that the difference of temperature for two stations in the United Kingdom, Kew and York, a similar distance apart, is merely 1.4° F., or about one-third of that shown to exist in the case of the Sudanese towns. The mean daily maximum and mean monthly maximum temperatures are both greatest in April with 101.9° F. and 106.5° F. respectively; the absolute maximum temperature of 111.2° F. was observed in May. The mean daily minimum is least in

December with  $60.1^{\circ}$  F., the mean monthly minimum in January with  $52.3^{\circ}$  F., and the absolute minimum of  $45.5^{\circ}$  F. in January—none of which temperatures are low considering the altitude. The range is greatest in January with  $49.1^{\circ}$  F., and least in August with  $26.1^{\circ}$  F.

*Rainfall* at Gallabat, 23.544 in., though twice as much as at Kassala, is only moderate; a mean maximum of 6.92 in. occurs in July and from 20 to 21 in. of the total precipitation fall from June to September. A monthly maximum of 12.953 in. has been observed in August and 45.45 in. has been recorded in one year. The greatest rainfall in 24 hours, 3.39 in., was noted in August. The mean number of rain days is 57 with a maximum of 14 in July; the average for the period June to September is 11 days per month. Mean *relative humidity* is greatest, 77 per cent., in August, least, 24 per cent., in February and April, with an average of 45 per cent. for the year. *Vapour pressure* attains a maximum of 17.3 mm. in September, the minimum, 6.5 mm., occurs in January, and the mean for the year is 11.7 mm. Mean daily evaporation is at its greatest in April, when it amounts to 0.595 in., and is least in August, when it averages 0.097 in., the lowest mean daily evaporation recorded in the Sudan; a maximum evaporation of 0.807 in. in 24 hours has been noted in March which is 0.14 in. more than the average amount of evaporation occurring in London for the entire month. *Cloud* values reach their maximum in July and August with a mean of 5.1, but the small winter average of 0.6 reduces the mean of the year to the comparatively low figure of 2.4. There is no available record of *thunderstorms*, although in this region they are not infrequent in the summer and early autumn. Mean *wind strength* is moderate, a maximum of 2.4 occurring in May, while the mean for the year is less than 2. The seasonal winds are as follows:

	N. + NE. + E.	SE. + S.	SW. + W. + NW.	Calm.
Winter	13 + 4 + 12 = 29 %	7 + 18 = 25 %	7 + 6 + 14 = 27 %	18 %
Spring	15 + 4 + 14 = 33 %	6 + 12 = 18 %	10 + 14 + 15 = 39 %	10 %
Summer	9 + 2 + 12 = 23 %	10 + 13 = 23 %	20 + 25 + 3 = 48 %	6 %
Autumn	10 + 4 + 11 = 25 %	9 + 15 = 24 %	10 + 22 + 5 = 37 %	14 %

The peculiar position of this station, it will be noted, gives wind directions differing from those observed at other stations in the Sudan; the change from north to south winds, for example, is not pronounced, as both north and south winds exist all the year round; there is, however, a clear predominance of southerly and westerly winds in summer. Calms are frequent, especially in winter.

## VI. WESTERN SUDAN

West Sudan or Kordofan is a fairly uniform plateau of 1,300–1,800 ft. elevation. In this district there are three seasons whose duration varies and whose boundaries are not strictly defined, Kharif, the rainy season, Shita or winter, Seif or summer. The season of El-Kharif starts at the beginning of June. On a warm afternoon heavy dark clouds approach from the south and bring heavy downpours which may last several days. The broken weather is then followed by days without wind or rain, and it is not until July that the S. and SW. winds become permanent. From this latter date rain may fall on any day until the end of September, but it usually rains only every third or fourth day. During the Kharif the wind is always from the S. or SW. and dark clouds cover the sky. Although the temperature is not abnormally high, the climate is most enervating and fever prevails, which towards the end of the rainy season attacks even Turks and Arabs who have lived there for a long time. At the end of September the wind direction changes, the wind becomes northerly and light and white clouds replace the heavy dark canopy. From the end of October the wind blows steadily from the north and the temperature falls. The dry air, refreshing N. winds, and cool nights restore the fever stricken and render the winter climatically delightful.

The rainfall being practically negligible from October onwards the wells mostly dry up before the end of January; indeed as early as the end of October the vegetation is burnt up and the country looks like a desert. In the southern part of the province the rainfall is greater and the rainy season there may be said to last six months.

*El-Obeid*

Lat. 13° 11' N., long. 30° 14' E., alt. 1,919 ft.

El-Obeid gives in its climatic results the best idea of conditions in north Kordofan. In this section the considerable altitude must be taken into account, when comparisons are made with respect to temperatures; thus the maximum mean temperature is only 85·4° F. in May, while the minimum reaches the low mean of 66·7° F. in January. Here again a rise in temperature occurs in October after the rains. The mean daily maximum temperature is 102·4° F. in May with a secondary rise to 97·3° F. in October; the mean monthly maximum is 108·3° F. in April with a secondary rise to 101·3° F. in October after a fall to 98·6° F. in August. The very high absolute maximum temperature of 124·0° F. has been registered in February and has only once been exceeded in the Sudan records, namely at Wadi Halfa when 126·5° F. was observed in April. The mean daily minimum of 51·4° F., the mean monthly minimum of 41·4° F., and the absolute minimum of 31·3° F. are all attributes of the January climate. From the data available this last record is the only instance of a temperature below freezing point having been reached in the Sudan. The mean range of temperature for the year amounts to 45·7° F. with a maximum of 59·4° F. in February and a minimum of 34·2° F. in July. The difference between the highest and lowest ranges, it will be noted, amounts to 25·2° F. and is only exceeded by that of Roseires among the Sudan stations. El-Obeid being situated almost as far north as the mid-Sudan station of Dueim, a high *rainfall* is not expected; the mean of 15 in. for the year, of which about 12½ in. fall from July to September, August being the rainiest month with a mean of 4·567 in., is less than half that of Kadugli though the latter station is only two degrees farther south. The winter months are absolutely rainless and very little precipitation occurs from mid-October to June. As stated above, with the cessation of rain at the end of September, the temperature rises in October and then falls steadily till January. The greatest rainfall ever recorded in any month was

8.78 in. in September, the greatest precipitation recorded in any year is no more than 22.1 in. ; while the heaviest fall in 24 hours, 2.87 in., occurred in September. There are 37 rain days on the average, of which 29 occur in July to September. The values of mean *relative humidity* vary between 73 per cent. in August and 21 per cent. in March with an average of 39 per cent for the year, results rather greater than at Dueim which has only a slightly higher latitude. The *vapour pressure* averages 9.8 mm. and varies between 17.5 mm. in August and 4.4 mm. in February. Mean daily evaporation attains a maximum in March, and a minimum in August, of 0.697 in. and 0.264 in. respectively, with a mean of 0.52 in. A maximum evaporation of 1.26 in. in twenty-four hours has been recorded in February. *Cloud* values average 4.1 in the rainy season and 0.66 in winter, with 2.15 for the year. On the average there are 13 thunderstorms in the year, of which 5 may be expected in the month of July ; in the year 1912, it is interesting to note, 18 thunderstorms were recorded in the month of July alone. Thunderstorms have not been recorded between October and February. The mean *wind strength* is 2.5 for the year with a maximum of 2.9 in June, which month has experienced a mean as low as 1.9 and as high as 5.1. The following table shows the seasonal distribution of winds ; also that calm days are very rare :

	N. + NE. + E.	S. + SW. + W.	NW.	Calm.
Winter	64 + 21 + 5 = 90 %	Nominal	7 %	0.1 %
Spring	44 + 21 + 7 = 72 %	4 + 6 + 9 = 19 %	7 %	0.3 %
Summer	4 + 3 + 3 = 10 %	28 + 31 + 26 = 85 %	3 %	1 %
Autumn	35 + 12 + 7 = 54 %	10 + 13 + 14 = 37 %	6 %	0.5 %

### Wau

Lat. 7° 42' N., long. 28° 3' E., alt. 1,444 ft.

Here again, as in places of corresponding latitude in south Sudan, it is found that the mean temperature is lowest, 76.6° F., in August and the course of temperature that of the southern hemisphere. The mean temperature is highest, 84.6° F., in March, the mean daily maximum temperature, 98.2° F., and the mean monthly maximum, 105.1° F., are also at their highest in this month, and in the case of the last

mentioned, in April, in which latter month the absolute maximum temperature of  $115.0^{\circ}$  F. was recorded. The lowest mean daily minimum temperature,  $63.0^{\circ}$  F., the lowest mean monthly minimum temperature,  $54.3^{\circ}$  F., and the absolute minimum temperature,  $50.0^{\circ}$  F., are all observed in January, which month experiences the greatest monthly range,  $47.0$  F., the least range,  $25.8^{\circ}$  F., occurring in August. The mean *rainfall* for the year,  $41.29$  in., of which amount 90 per cent. falls in the six months May to October, is considerable. Rain is recorded in all months except December and January, but it is sporadic and light in February, March, and November. In August the maximum mean monthly fall of  $8.54$  in. occurs. The maximum fall that has occurred in any month is  $13$  in. in August and the maximum fall for any single year  $54$  in. The heaviest fall in 24 hours was  $3.38$  in. in June. The mean number of rain days in the year is  $84.5$ , with  $15$  in August, the rainiest month. The mean *relative humidity*, 68 per cent. for the year, is high; in August, when the maximum is attained, the mean is 86 per cent., and it is never less throughout the year than 46 per cent., the January mean. *Vapour pressure* is least,  $9.6$  mm., in January and greatest,  $18.6$  mm., in May; having attained the maximum the mean vapour pressure remains at  $18$  mm. or more until November, these high values being caused by the humid climate. Mean *daily evaporation* varies between  $0.592$  in. in March and  $0.143$  in. in August; a maximum evaporation of  $0.984$  in. for 24 hours has been recorded in January, February, and March. *Cloud* values reach a maximum in August with  $5.7$ , a minimum in December with  $1.2$ , and an average of  $3.3$  for the year. The wind strength is of a moderate average all the year round with a maximum of  $2.8$  in December, a minimum of  $1.97$  in September and a mean of  $2.45$  for the year. The following table of seasonal winds shows that both northerly and southerly winds blow to a varying extent and are not mutually exclusive as they are farther north:

	NW. + N. + NE.	SE. + S. + SW.	Calm.
Winter	. $17 + 33 + 17 = 67\%$	$11 + 3 + 9 = 23\%$	5 %
Spring	. $10 + 14 + 13 = 37\%$	$10 + 19 + 26 = 55\%$	1 %
Summer	. $16 + 4 + 2 = 22\%$	$11 + 21 + 31 = 63\%$	7 %
Autumn	. $13 + 12 + 12 = 37\%$	$14 + 9 + 22 = 45\%$	9 %

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**TABLE I**  
**MEAN TEMPERATURE**

	<i>Jan.</i> ° F.	<i>Feb.</i> ° F.	<i>Mar.</i> ° F.	<i>April.</i> ° F.	<i>May.</i> ° F.	<i>June.</i> ° F.
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	53·3	61·9	69·6	78·8	86·4	89·2
Merowe . . .	66·9	70·2	76·1	84·0	90·6	93·2
Atbara . . .	68·0	70·0	77·4	84·2	91·2	92·7
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	70·7	74·1	79·7	86·3	91·4	91·5
Wad Medani . . .	71·6	74·1	80·4	87·1	89·8	87·6
Dueim . . .	70·5	73·4	79·2	86·4	89·4	87·3
Roseiros . . .	74·8	77·9	82·8	86·0	85·1	79·5
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . .	76·8	79·7	84·9	84·9	81·7	77·4
Doleib Hilla . . .	79·0	81·0	85·5	87·4	84·4	81·0
Gambeila . . .	79·2	83·3	83·8	84·2	81·7	80·2
Mongalla . . .	80·6	81·0	82·9	80·8	78·5	77·5
Nimule . . .	81·9	82·8	84·5	82·6	81·7	80·8
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . .	70·0	70·5	72·5	76·6	82·4	86·0
Port Sudan . . .	73·0	73·2	74·5	78·8	84·0	88·5
Suakin . . .	73·4	73·4	75·2	79·0	85·3	90·7
<b>East Sudan, 12°-16° :</b>						
Kassala . . .	73·9	76·6	81·5	87·1	90·5	87·8
Gallabat . . .	76·0	79·2	83·5	85·3	84·0	77·9
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . .	66·7	70·0	75·6	82·6	85·4	84·4
Kadugli (2-3 years) . . .	78·6	79·2	82·4	85·3	83·8	80·1
Kafia Kingi . . .	73·6	73·2	80·0	83·8	75·6	77·0
(8 a.m., 1-3 years)						
Raga (1-4 years) . . .	76·1	77·0	82·8	86·4	—	—
Wau . . .	78·8	81·1	84·6	84·2	81·5	79·2

<i>July.</i> ° F.	<i>Aug.</i> ° F.	<i>Sept.</i> ° F.	<i>Oct.</i> ° F.	<i>Nov.</i> ° F.	<i>Dec.</i> ° F.	<i>Year.</i> ° F.	
<b>89·2</b>	88·3	85·6	81·1	70·0	61·2	76·6	<b>North Sudan, 16°–22° N. :</b>
<b>91·9</b>	91·6	91·6	86·9	78·1	68·7	82·4	Wadi Halfa
<b>90·0</b>	89·6	90·0	86·7	78·8	70·7	82·4	Merowe.
							Atbara.
							<b>Mid-Sudan, 10°–16° N. :</b>
<b>87·6</b>	86·4	88·1	87·8	81·0	73·0	83·1	Khartoum.
<b>81·9</b>	81·1	82·4	84·6	81·1	73·8	81·3	Wad Medani.
<b>82·0</b>	81·1	82·4	84·9	80·1	72·7	80·8	Dueim.
<b>75·7</b>	74·8	75·6	78·1	78·1	75·0	78·6	Roseires.
							<b>South Sudan, 3°–10° N. :</b>
<b>74·8</b>	75·7	77·5	78·3	78·6	76·5	78·9	Kodok.
<b>78·4</b>	77·9	79·9	81·0	80·6	77·7	81·2	Doleib Hilla.
<b>79·0</b>	78·3	77·4	79·0	78·8	77·5	80·2	Gambeila.
<b>75·7</b>	75·7	77·7	78·4	79·3	78·8	79·0	Mongalla.
<b>79·0</b>	77·2	79·2	80·1	80·9	80·9	80·9	Nimule.
							<b>Red Sea, 19°–21° N. :</b>
<b>88·2</b>	<b>89·2</b>	86·4	82·2	78·1	72·9	79·6	Dongonab.
<b>91·9</b>	<b>92·1</b>	87·8	83·5	80·2	75·9	81·9	Port Sudan.
<b>94·1</b>	<b>94·5</b>	90·1	85·3	80·4	75·2	83·0	Suakin.
							<b>East Sudan, 12°–16° :</b>
<b>82·6</b>	81·0	82·9	85·5	82·8	76·1	82·4	Kassala.
<b>73·8</b>	<b>72·7</b>	74·7	77·0	76·8	75·6	78·1	Gallabat.
							<b>West Sudan, 7°–13° N. :</b>
<b>80·3</b>	78·8	79·7	80·8	75·7	70·3	77·4	El-Obeid.
<b>77·2</b>	<b>77·0</b>	77·0	77·4	77·5	75·0	79·0	Kadugli (2–3 yrs.).
<b>73·4</b>	<b>71·8</b>	74·1	73·8	71·8	70·2	75·0	Kafia Kingi (8 a.m., 1–3 yrs.).
<b>78·8</b>	<b>76·3</b>	78·4	78·8	74·8	73·0	—	Raga (1–4 yrs.).
<b>77·0</b>	<b>76·6</b>	78·1	79·0	79·2	77·4	79·7	Wau.

**TABLE II**  
**MEAN DAILY MAXIMUM TEMPERATURE**

	<i>Jan.</i> ° F.	<i>Feb.</i> ° F.	<i>Mar.</i> ° F.	<i>April.</i> ° F.	<i>May.</i> ° F.	<i>June.</i> ° F.
<b>North Sudan, 16°–22° N. :</b>						
Wadi Halfa . . .	74.5	79.2	88.2	95.9	103.6	<b>106.5</b>
Merowe . . .	84.2	88.5	94.3	101.7	107.6	<b>109.8</b>
Atbara . . .	86.4	89.2	96.1	102.6	108.5	<b>110.5</b>
<b>Mid-Sudan, 10°–16° N. :</b>						
Khartoum . . .	87.2	91.0	97.3	103.2	<b>107.9</b>	107.1
Wad Medani . . .	93.2	95.5	101.7	106.3	<b>108.3</b>	104.7
Dueim . . .	90.7	93.9	99.1	<b>105.1</b>	104.7	103.5
Roseires . . .	97.0	99.9	103.5	<b>104.9</b>	102.4	95.7
<b>South Sudan, 3°–10° N. :</b>						
Kodok . . .	95.0	98.1	<b>101.6</b>	101.1	97.5	91.0
Doleib Hilla . . .	97.9	99.5	103.8	<b>104.0</b>	97.9	92.1
Gambeila . . .	97.1	100.1	<b>101.2</b>	98.5	93.4	89.6
Mongalla . . .	<b>98.8</b>	97.8	98.1	<b>93.9</b>	90.7	90.3
Nimule . . .	96.4	96.1	<b>96.6</b>	94.2	91.8	90.6
<b>Red Sea, 19°–21° N. :</b>						
Dongonab . . .	76.6	77.5	80.1	85.6	91.8	98.4
Port Sudan . . .	80.6	81.1	82.9	88.2	94.3	101.3
Suakin . . .	79.0	78.8	80.8	84.9	91.9	100.0
<b>East Sudan, 12°–16° N. :</b>						
Kassala . . .	91.8	95.9	99.7	104.0	<b>105.6</b>	102.2
Gallabat . . .	95.7	97.5	100.8	<b>101.9</b>	98.8	91.0
<b>West Sudan, 7°–13° N. :</b>						
El-Obeid . . .	86.0	90.0	95.5	100.8	<b>102.4</b>	99.3
Kadugli . . .	95.5	95.9	100.6	<b>104.4</b>	99.0	93.0
Kafia Kingi (1 year) . . .	—	—	—	—	—	<b>90.9</b>
Raga (1–4 years) . . .	92.5	93.2	98.2	<b>99.5</b>	93.0	91.2
Wau . . .	95.4	96.6	99.5	<b>98.2</b>	94.1	90.0

<i>July.</i> ° F.	<i>Aug.</i> ° F.	<i>Sept.</i> ° F.	<i>Oct.</i> ° F.	<i>Nov.</i> ° F.	<i>Dec.</i> ° F.	<i>Year.</i> ° F.	
105.3	103.6	100.8	97.3	86.2	77.4	93.2	<b>North Sudan, 16°-22° N. :</b>
107.4	106.5	107.6	103.8	94.3	85.5	99.3	Wadi Halfa.
105.3	104.2	105.7	102.8	95.5	88.3	99.5	Merowe.
							Atbara.
							<b>Mid-Sudan, 10°-16° N. :</b>
101.1	98.7	102.2	102.4	96.6	89.4	98.6	Khartoum.
98.4	97.0	99.1	102.7	99.7	94.3	100.1	Wad Medani.
96.8	94.1	97.0	101.7	97.7	91.8	98.0	Dueim.
89.8	88.9	91.9	96.3	98.6	96.8	97.1	Roseires.
							<b>South Sudan, 3°-10° N. :</b>
87.4	87.6	90.5	93.0	95.5	94.5	94.4	Kodok.
89.1	88.9	92.7	95.4	96.8	96.3	96.2	Doleib Hilla.
89.2	89.3	90.1	93.9	95.2	95.4	94.4	Gambeila.
87.4	88.0	91.0	92.8	94.1	95.5	93.2	Mongalla.
89.9	88.0	90.7	91.6	92.4	93.1	92.6	Nimule.
							<b>Red Sea, 19°-21° N. :</b>
100.6	100.4	98.1	90.1	85.1	79.2	88.6	Dongonab.
105.3	104.7	99.7	92.5	87.3	82.0	91.6	Port Sudan.
107.1	106.9	98.8	91.0	86.2	81.5	90.6	Suakin.
							<b>East Sudan, 12°-16° N. :</b>
94.8	92.5	96.8	100.6	98.2	93.6	98.0	Kassala.
84.4	82.8	86.7	92.8	95.8	94.8	93.6	Gallabat.
							<b>West Sudan, 7°-13° N. :</b>
93.2	90.5	93.9	97.3	93.2	88.2	94.3	El-Obeid.
88.5	87.4	90.1	94.5	97.9	93.6	95.0	Kadugli.
86.5	85.6	87.3	89.1	87.6	—	—	Kafia Kingi (1 yr.).
87.4	85.8	87.8	90.1	91.9	90.7	91.8	Raga (1-4 yrs.).
87.3	87.1	89.8	91.9	94.3	93.9	93.2	Wau.

TABLE III

## MEAN DAILY MINIMUM TEMPERATURE

	<i>Jan.</i> ° F.	<i>Feb.</i> ° F.	<i>Mar.</i> ° F.	<i>April.</i> ° F.	<i>May.</i> ° F.	<i>June</i> ° F.
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	46.4	48.2	55.2	63.0	69.8	74.1
Merowe . . .	52.9	55.9	61.7	68.2	75.1	77.7
Atbara . . .	55.6	57.4	62.8	67.6	75.6	78.3
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	58.4	61.3	65.0	70.7	77.7	79.1
Wad Medani . . .	59.7	60.4	64.4	71.1	75.2	72.5
Dueim . . .	56.8	58.5	63.1	68.5	73.6	73.8
Roseires . . .	59.9	63.3	67.6	70.9	74.1	72.0
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . .	63.5	66.4	71.6	72.5	71.1	68.2
Doleib Hilla . . .	63.0	65.7	70.7	72.9	72.5	69.8
Gambeila . . .	62.6	65.7	70.0	70.5	70.0	68.8
Mongalla . . .	66.4	68.5	72.0	72.3	70.5	69.4
Nimule . . .	67.4	69.6	72.4	71.0	71.6	71.1
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . .	62.8	63.0	64.0	66.6	71.4	72.7
Port Sudan . . .	66.4	66.2	66.6	69.8	74.0	77.5
Suakin. . .	67.1	68.0	68.4	70.9	75.2	78.4
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . .	59.7	62.4	66.0	72.1	77.4	76.6
Gallabat . . .	61.2	64.6	68.0	68.8	73.4	70.0
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . .	51.4	54.5	57.7	66.2	70.9	72.5
Kadugli . . .	61.7	62.4	68.2	68.9	70.7	69.4
Kafia Kingi (1 year) . . .	—	—	—	—	—	69.4
Raga (1-2 years) . . .	59.7	60.6	67.3	72.7	—	—
Wau . . .	63.0	65.7	69.4	72.7	72.0	70.2

<i>July.</i> ° F.	<i>Aug.</i> ° F.	<i>Sept.</i> ° F.	<i>Oct.</i> ° F.	<i>Nov.</i> ° F.	<i>Dec.</i> ° F.	<i>Year.</i> ° F.	
73·9	74·5	72·9	68·2	57·4	49·6	62·8	<b>North Sudan, 16°-22° N. :</b>
78·1	78·6	77·9	72·3	64·0	54·9	68·2	Wadi Halfa.
78·3	76·8	78·1	73·6	66·6	58·1	69·0	Merowe.
							Atbara.
77·1	76·4	77·0	75·5	68·9	60·6	70·7	<b>Mid-Sudan, 10°-16° N. :</b>
71·4	69·6	71·8	72·5	68·4	61·2	68·2	Khartoum.
73·2	72·5	72·5	72·7	67·1	58·8	67·6	Wad Medani.
70·0	69·6	68·5	67·8	64·2	60·4	66·8	Dueim.
							Roseires.
66·4	68·8	68·9	68·0	64·9	62·6	67·7	<b>South Sudan, 3°-10° N. :</b>
70·3	69·4	69·6	68·5	65·8	62·2	68·4	Kodok.
67·6	67·3	64·2	64·2	62·2	60·1	66·1	Doleib Hilla.
68·4	68·2	69·3	69·2	69·3	66·7	69·1	Gambeila.
68·2	66·4	67·6	68·7	69·4	68·7	69·3	Mongalla.
							Nimule.
77·0	78·6	75·6	72·3	70·0	65·5	70·0	<b>Red Sea, 19°-21° N. :</b>
81·9	81·9	77·0	76·1	73·0	69·4	73·3	Dongonab.
82·0	83·5	79·0	75·6	72·9	68·7	74·1	Port Sudan.
							Suakin.
73·0	72·1	72·9	73·6	70·5	62·2	69·9	<b>East Sudan, 12°-16° N. :</b>
64·7	64·6	65·3	65·1	61·7	60·1	65·6	Kassala.
							Gallabat.
71·6	70·3	69·4	68·5	60·8	52·5	64·0	<b>West Sudan, 7°-13° N. :</b>
67·8	66·7	65·5	63·1	59·0	59·0	65·5	El-Obeid.
67·6	67·6	67·8	68·5	—	—	—	Kadugli.
70·2	66·7	69·1	67·5	58·3	53·6	—	Kafia Kingi (1 yr.).
69·8	68·7	68·5	68·2	67·1	63·1	68·2	Raga (1-2 yrs.).
							Wau.

**TABLE IV**  
**MEAN MONTHLY MAXIMUM TEMPERATURE**

	<i>Jan.</i> ° F.	<i>Feb.</i> ° F.	<i>Mar.</i> ° F.	<i>April.</i> ° F.	<i>May.</i> ° F.	<i>June</i> ° F.
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . . . .	89.8	96.9	101.7	109.0	<b>114.0</b>	113.8
Merowe . . . . .	96.6	99.7	107.8	112.1	115.0	<b>116.1</b>
Atbara . . . . .	96.6	101.5	107.6	111.6	114.1	<b>114.3</b>
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . . . .	98.4	104.0	108.1	112.1	111.9	<b>112.6</b>
Wad Medani . . . . .	101.1	106.0	111.0	<b>113.4</b>	<b>113.4</b>	111.6
Dueim . . . . .	99.5	104.7	109.6	<b>112.5</b>	111.6	109.9
Roseires . . . . .	103.6	106.3	109.2	<b>109.4</b>	107.2	102.6
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . . . .	101.7	104.4	106.5	<b>107.1</b>	103.6	99.5
Doleib Hilla . . . . .	105.1	108.5	<b>110.8</b>	109.0	106.0	104.0
Gambeila . . . . .	103.3	104.2	<b>106.0</b>	105.3	100.0	96.3
Mongalla . . . . .	104.5	<b>105.3</b>	105.1	100.9	98.1	96.8
Nimule . . . . .	101.7	102.5	<b>103.2</b>	99.6	96.6	95.2
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . . . .	82.8	82.6	88.0	93.7	103.3	108.0
Port Sudan . . . . .	85.8	88.0	88.5	94.8	103.6	109.9
Suakin . . . . .	84.7	84.7	86.5	91.6	101.3	112.6
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . . . .	100.8	101.1	107.6	109.9	<b>110.1</b>	108.0
Gallabat . . . . .	101.4	103.3	105.8	<b>106.5</b>	105.1	99.0
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . . . .	96.8	103.5	105.1	<b>108.3</b>	107.6	105.3
Kadugli . . . . .	104.9	104.4	108.1	<b>110.7</b>	105.4	101.5
Raga . . . . .	99.0	100.6	103.6	<b>104.9</b>	—	—
Wau . . . . .	101.3	103.8	<b>105.1</b>	<b>105.1</b>	100.9	95.5

<i>July.</i> ° F.	<i>Aug.</i> ° F.	<i>Sept.</i> ° F.	<i>Oct.</i> ° F.	<i>Nov.</i> ° F.	<i>Dec.</i> ° F.	
113.0	110.3	109.8	106.9	95.5	87.9	<b>North Sudan, 16°-22° N. :</b>
113.5	112.3	112.8	110.3	101.3	95.9	Wadi Halfa.
110.8	110.7	110.3	107.8	102.6	97.2	Merowe.
						Atbara.
108.0	106.2	108.1	107.8	103.5	97.1	<b>Mid-Sudan, 10°-16° N. :</b>
106.5	103.1	106.3	107.6	106.0	100.4	Khartoum.
104.4	102.2	106.0	107.2	105.4	98.8	Wad Medani.
95.9	94.8	97.3	100.4	101.5	107.4	Dueim.
						Roseires.
94.3	92.8	96.1	97.7	99.3	99.9	<b>South Sudan, 3°-10° N. :</b>
95.5	95.0	101.1	100.2	101.5	101.8	Kodok.
94.5	95.7	97.0	99.5	99.0	99.7	Doleib Hilla.
93.4	93.0	96.8	97.9	98.8	100.6	Gambeila.
95.7	93.2	94.9	96.1	95.8	97.5	Mongalla.
						Nimule.
112.1	111.4	108.1	98.4	91.0	85.1	<b>Red Sea, 19°-21° N. :</b>
113.4	113.0	109.4	97.9	91.9	87.4	Dongonab.
115.7	114.4	111.4	96.1	91.6	86.9	Port Sudan.
						Suakin.
101.1	98.2	102.6	104.2	102.6	99.0	<b>East Sudan, 12°-16° N. :</b>
90.7	87.4	91.2	98.6	99.7	98.6	Kassala.
						Gallabat.
99.9	98.6	99.9	101.3	98.4	95.5	<b>West Sudan, 7°-13° :</b>
95.0	95.9	96.4	100.0	100.9	101.3	El-Obeid.
93.2	91.9	93.0	94.5	95.0	96.3	Kadugli.
91.8	91.9	94.6	97.2	98.2	98.6	Raga.
						Wau.



TABLE V

## MEAN MONTHLY MINIMUM TEMPERATURE

	<i>Jan.</i> ° F.	<i>Feb.</i> ° F.	<i>Mar.</i> ° F.	<i>April.</i> ° F.	<i>May.</i> ° F.	<i>June.</i> ° F.
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	35.6	35.8	41.7	49.6	58.8	63.9
Merowe . . .	46.0	50.5	54.5	60.1	66.4	71.4
Atbara . . .	45.5	47.3	53.1	56.8	64.6	70.5
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	47.8	51.6	55.4	59.5	71.6	72.1
Wad Medani . . .	49.3	50.4	54.5	59.7	66.2	65.3
Dueim . . .	46.6	49.3	53.2	59.7	67.1	67.3
Roseires . . .	50.5	55.8	57.2	62.4	67.6	68.0
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . .	54.5	59.4	62.4	65.8	65.1	62.4
Doleib Hilla . . .	54.0	57.7	63.1	66.9	66.2	65.1
Gambeila . . .	50.4	53.6	60.3	65.3	65.7	65.3
Mongalla . . .	59.9	61.2	64.0	67.8	64.4	65.8
Nimule . . .	62.0	64.2	65.5	65.1	67.1	64.8
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . .	50.7	55.6	57.0	57.4	62.6	67.1
Port Sudan . . .	55.9	57.4	59.0	62.1	66.9	72.0
Suakin . . .	58.6	60.8	61.2	64.9	68.9	73.0
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . .	48.6	52.0	54.9	59.9	68.0	69.8
Gallabat . . .	52.3	56.3	58.5	59.5	65.3	64.8
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . .	41.4	44.1	49.6	56.1	63.1	66.9
Kadugli . . .	51.8	53.1	58.3	58.5	64.0	63.7
Raga . . .	—	—	—	—	—	—
Wau . . .	54.3	58.6	60.1	64.2	67.3	66.2

<i>July.</i> ° F.	<i>Aug.</i> ° F.	<i>Sept.</i> ° F.	<i>Oct.</i> ° F.	<i>Nov.</i> ° F.	<i>Dec.</i> ° F.	
65.3	66.4	64.8	55.8	49.6	38.5	<b>North Sudan, 16°-22° N. :</b>
72.1	72.7	70.5	62.6	55.6	48.6	Wadi Halfa.
70.6	70.2	71.8	67.0	59.5	48.7	Merowe.
						Atbara.
69.8	68.7	69.8	68.5	61.9	51.3	<b>Mid-Sudan, 10°-16° N. :</b>
66.6	65.3	66.7	67.5	61.9	52.3	Khartoum.
66.9	67.1	66.4	66.2	58.6	49.1	Wad Medani.
67.3	65.7	65.3	63.7	58.5	53.2	Dueim.
						Roseires.
62.8	65.5	64.9	63.1	58.6	56.7	<b>South Sudan, 3°-10° N. :</b>
65.8	65.7	65.8	65.3	59.7	55.8	Kodok.
63.5	62.6	57.9	59.7	59.7	54.7	Doleib Hilla.
65.3	64.6	65.8	66.0	65.5	65.1	Gambeila.
64.2	61.0	62.3	65.1	64.3	65.2	Mongalla.
						Nimule.
70.7	73.8	69.1	65.7	62.8	57.0	<b>Red Sea, 19°-21° N. :</b>
75.4	75.7	68.7	68.5	65.8	62.1	Dongonab.
76.3	78.1	72.9	69.4	68.2	63.3	Port Sudan.
						Suakin.
66.0	66.0	66.2	66.9	60.3	51.8	<b>East Sudan, 12°-16° N. :</b>
62.1	61.3	62.4	61.3	55.4	52.9	Kassala.
						Gallabat.
65.7	63.1	63.9	61.5	53.8	42.8	<b>West Sudan, 7°-13° N. :</b>
62.6	63.5	62.1	53.6	49.6	51.8	El-Obeid.
—	59.7	66.6	60.6	—	50.4	Kadugli.
66.0	65.8	65.8	65.7	61.5	56.7	Raga.
						Wau.

TABLE VI

MEAN MONTHLY RANGE OF TEMPERATURE (Mean Monthly  
Maximum Temperature less Mean Monthly Minimum)

	<i>Jan.</i> ° F.	<i>Feb.</i> ° F.	<i>Mar.</i> ° F.	<i>April.</i> ° F.	<i>May.</i> ° F.	<i>June.</i> ° F.
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . . . .	54.2	61.1	60.0	59.4	55.2	49.9
Merowe . . . . .	50.6	49.2	53.3	52.0	48.6	44.7
Atbara . . . . .	51.1	54.2	54.5	54.8	49.5	43.8
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . . . .	50.6	52.4	52.7	52.6	40.3	40.5
Wad Medani . . . . .	51.8	55.6	56.5	53.7	47.2	46.3
Dueim . . . . .	52.9	55.4	56.4	52.8	44.5	42.6
Roseires . . . . .	53.1	50.5	52.0	47.0	39.6	34.6
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . . . .	47.2	45.0	44.1	41.3	38.5	37.1
Doleib Hilla . . . . .	51.1	50.8	47.7	42.1	39.8	38.9
Gambeila . . . . .	52.9	50.6	45.7	40.0	34.3	31.0
Mongalla . . . . .	44.6	44.1	41.1	33.1	33.7	31.0
Nimule . . . . .	39.7	38.3	37.7	34.5	29.5	30.4
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . . . .	32.1	27.0	31.0	36.3	40.7	40.9
Port Sudan . . . . .	29.9	30.6	29.5	32.7	36.7	37.9
Suakin. . . . .	26.1	23.9	25.3	26.7	32.4	39.6
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . . . .	52.2	49.1	52.7	50.0	42.1	38.2
Gallabat . . . . .	49.1	47.0	47.3	47.0	39.8	34.2
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . . . .	55.4	59.4	55.5	52.2	44.5	38.4
Kadugli . . . . .	53.1	51.3	49.8	52.2	41.4	37.8
Raga . . . . .	—	—	—	—	—	—
Wau . . . . .	47.0	45.2	45.0	40.9	33.6	29.3

<i>July.</i> ° F.	<i>Aug.</i> ° F.	<i>Sept.</i> ° F.	<i>Oct.</i> ° F.	<i>Nov.</i> ° F.	<i>Dec.</i> ° F.	<i>Differ- ence between highest and lowest ranges</i> ° F.	
47.7	43.9	45.0	51.1	45.9	49.4	17.2	<b>North Sudan, 16°-22° N. :</b>
41.4	39.6	42.3	47.7	45.7	47.3	13.7	Wadi Halfa.
40.2	40.5	38.5	40.8	43.1	48.5	16.3	Merowe.
							Atbara.
38.2	37.5	38.3	39.3	42.6	45.8	15.2	<b>Mid-Sudan, 10°-16° N. :</b>
39.9	37.8	39.6	40.1	44.1	48.1	18.7	Khartoum.
37.5	35.1	39.6	41.0	46.8	49.7	21.3	Wad Medani.
28.6	29.1	32.0	36.7	43.0	54.2	25.6	Duelm.
							Roseires.
31.5	27.3	31.2	34.6	40.7	43.2	19.9	<b>South Sudan, 3°-10° N. :</b>
29.7	29.3	35.3	34.9	41.8	46.0	21.8	Kodok.
31.0	33.1	39.1	39.8	39.3	45.0	21.9	Doleib Hilla.
28.1	28.4	31.0	31.9	33.3	35.5	16.5	Gambeila.
31.5	32.2	32.6	31.0	31.5	32.3	10.2	Mongalla.
							Nimule.
41.4	37.6	39.0	32.7	28.2	28.1	14.4	<b>Red Sea, 19°-21° N. :</b>
38.0	37.3	40.7	29.4	26.1	25.3	15.4	Dongonab.
39.4	36.3	38.5	26.7	23.4	23.6	16.2	Port Sudan.
							Suakin.
35.1	32.2	36.4	37.3	42.3	47.2	20.5	<b>East Sudan, 12°-16° N. :</b>
28.6	26.1	28.8	37.3	44.3	45.7	23.0	Kassala.
							Gallabat.
34.2	35.5	36.0	39.8	44.6	52.7	25.2	<b>West Sudan, 7°-13° N. :</b>
32.4	32.4	34.3	46.4	51.3	52.2	20.7	El-Obeid.
—	39.2	26.4	33.9	—	45.9	—	Kadugli.
25.8	26.1	28.8	31.5	36.7	41.9	21.2	Raga.
							Wau.

TABLE VII

## ABSOLUTE MAXIMUM TEMPERATURE

	<i>Jan.</i> ° F.	<i>Feb.</i> ° F.	<i>Mar.</i> ° F.	<i>April.</i> ° F.	<i>May.</i> ° F.	<i>June.</i> ° F.
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	97.7	103.1	115.7	<b>126.5</b>	116.6	118.9
Merowe . . .	100.9	106.2	110.3	114.8	118.8	118.2
Atbara . . .	99.5	104.9	111.2	114.8	<b>116.6</b>	<b>116.6</b>
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	102.6	107.6	111.2	114.8	115.9	114.4
Wad Medani . . .	104.0	111.2	<b>117.5</b>	<b>117.5</b>	116.6	116.6
Dueim . . .	103.1	107.6	113.0	116.2	114.8	113.0
Roseires . . .	105.8	108.5	<b>112.6</b>	111.2	109.8	104.9
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . .	102.9	106.7	107.6	<b>109.4</b>	<b>106.3</b>	100.4
Doleib Hilla . . .	108.0	112.1	<b>116.6</b>	111.4	109.6	113.0
Gambeila . . .	104.9	105.8	<b>107.6</b>	<b>107.6</b>	102.2	97.7
Mongalla . . .	<b>110.3</b>	107.8	108.5	105.8	103.1	104.0
Nimule . . .	109.2	108.4	<b>110.2</b>	106.1	101.2	99.4
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . .	85.3	84.9	91.4	95.5	<b>107.6</b>	111.2
Port Sudan . . .	87.8	98.6	89.6	100.4	108.5	113.9
Suakin. . .	90.5	88.7	88.7	98.2	111.6	118.4
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . .	103.1	105.8	110.3	<b>112.1</b>	<b>112.1</b>	110.3
Gallabat . . .	104.0	105.8	107.6	108.5	<b>111.2</b>	102.2
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . .	101.1	<b>124.0</b>	109.4	111.2	109.4	109.0
Kadugli . . .	104.9	104.9	109.4	<b>113.0</b>	108.5	103.1
Kafia Kingi (1 year)	—	—	—	—	—	<b>95.7</b>
Raga (1-4 years) . .	99.3	100.9	103.6	<b>105.4</b>	97.2	99.3
Wau . . .	102.2	105.8	106.7	<b>115.0</b>	104.9	98.6

<i>July.</i> ° F.	<i>Aug.</i> ° F.	<i>Sept.</i> ° F.	<i>Oct.</i> ° F.	<i>Nov.</i> ° F.	<i>Dec.</i> ° F.	
116.6	116.1	117.5	116.6	114.8	102.2	<b>North Sudan, 16°-22° N. :</b>
119.7	114.3	115.7	111.2	105.3	99.0	Wadi Halfa.
113.0	116.6	113.0	110.3	106.7	100.4	Merowe.
						Atbara.
116.6	109.4	110.3	109.4	106.2	102.2	<b>Mid-Sudan, 10°-16° N. :</b>
113.0	110.3	112.1	114.8	116.6	106.7	Khartoum.
110.3	108.5	117.5	116.6	117.5	102.2	Wad Medani.
98.6	102.2	99.5	102.2	102.2	104.0	Dueim.
						Roseires.
101.3	93.2	98.6	100.4	100.4	101.3	<b>South Sudan, 3°-10° N. :</b>
100.6	98.4	114.8	102.6	104.0	105.8	Kodok.
96.8	98.6	101.3	102.2	100.4	100.4	Doleib Hilla.
97.5	96.8	101.3	103.1	101.1	104.0	Gambeila.
98.4	99.4	99.5	99.8	98.2	101.0	Mongalla.
						Nimule.
113.0	114.6	109.6	100.8	93.7	87.6	<b>Red Sed, 19°-21° N. :</b>
117.5	115.7	111.2	99.0	94.1	88.7	Dongonab.
118.9	118.4	117.5	100.9	95.9	91.0	Port Sudan.
						Suakin.
104.9	102.0	105.1	106.7	105.1	100.4	<b>East Sudan, 12°-16° N. :</b>
97.7	87.8	95.0	102.2	103.1	99.5	Kassala.
						Gallabat.
104.4	115.0	103.3	105.8	100.9	99.0	<b>West Sudan, 7°-13° N. :</b>
97.7	103.1	97.7	103.1	103.1	104.0	El-Obeid.
92.3	87.8	93.2	93.2	95.0	—	Kadugli.
93.6	92.5	94.6	95.2	95.9	97.2	Kafia Kingi (1 yr.).
94.1	93.2	96.8	98.2	101.3	101.3	Raga (1-4 yrs.).
						Wau.

TABLE VIII

## ABSOLUTE MINIMUM TEMPERATURE

	<i>Jan.</i> ° F.	<i>Feb.</i> ° F.	<i>Mar.</i> ° F.	<i>April.</i> ° F.	<i>May</i> ° F.	<i>June.</i> ° F.
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	33·8	33·8	38·3	47·3	55·4	59·9
Merowe . . .	33·3	43·3	50·5	52·7	56·7	63·5
Atbara . . .	37·4	39·2	42·8	51·8	58·1	66·2
<b>Mid Sudan, 10°-16° N. :</b>						
Khartoum . . .	41·4	44·4	51·8	52·5	63·5	68·0
Wad Medani . . .	45·5	44·6	49·1	52·7	54·5	50·0
Dueim . . .	38·2	41·0	50·0	49·1	64·4	57·2
Roseires . . .	45·5	51·8	51·8	58·1	64·4	66·7
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . .	50·9	55·4	58·6	64·4	62·6	49·5
Doleib Hilla . . .	48·2	48·2	60·8	61·7	61·7	62·6
Gambeila . . .	46·8	50·9	57·2	60·8	64·4	64·4
Mongalla . . .	55·4	51·8	59·0	65·3	56·3	57·2
Nimule . . .	53·0	58·0	55·1	61·0	63·0	58·0
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . .	45·3	50·7	54·3	54·1	57·4	65·3
Port Sudan . . .	50·0	51·8	57·2	59·0	62·6	69·8
Suakin . . .	50·0	50·0	50·0	46·0	62·6	66·9
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . .	42·8	46·4	51·8	55·0	59·0	60·8
Gallabat . . .	45·5	51·8	53·6	50·0	59·0	56·3
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . .	31·3	39·0	43·0	46·2	58·8	55·9
Kadugli . . .	51·8	50·9	54·5	57·2	60·8	60·8
Kafia Kingi (1 year) . . .	—	—	—	—	—	66·2
Raga (1-2 years) . . .	51·6	48·2	54·0	61·7	—	—
Wau . . .	50·0	50·9	57·2	58·1	65·3	63·5

<i>July.</i> ° F.	<i>Aug.</i> ° F.	<i>Sept.</i> ° F.	<i>Oct.</i> ° F.	<i>Nov.</i> ° F.	<i>Dec.</i> ° F.	
59.0	57.2	55.0	42.1	39.2	33.8	<b>North Sudan 16°-22° N. :</b>
65.7	63.3	61.7	53.1	43.5	41.9	Wadi Halfa.
60.8	59.0	59.0	56.3	49.1	41.0	Merowe.
						Atbara.
						<b>Mid-Sudan, 10°-16° N. :</b>
66.2	64.4	60.8	61.7	54.5	44.6	Khartoum.
62.6	60.8	64.4	64.4	53.6	49.1	Wad Medani.
64.4	64.4	55.4	62.6	53.6	43.7	Dueim.
64.8	64.9	60.8	59.9	53.6	48.2	Roseires.
						<b>South Sudan, 3°-10° N. :</b>
50.0	63.3	59.0	50.0	51.8	53.6	Kodok.
61.7	64.4	64.4	63.5	53.6	52.5	Doleib Hilla.
62.6	60.8	46.8	48.6	50.4	49.5	Gambeila.
57.2	59.0	64.0	64.4	62.6	55.4	Mongalla.
57.0	57.0	56.0	58.0	58.0	56.0	Nimule.
						<b>Red Sea, 19°-21° N. :</b>
66.2	72.1	67.8	64.2	59.9	55.0	Dongonab.
72.5	70.7	57.2	61.0	51.8	52.7	Port Sudan.
69.1	69.6	66.0	59.0	55.4	51.8	Suakin.
						<b>East Sudan, 12°-16° N. :</b>
59.0	59.9	59.0	61.7	55.4	49.1	Kassala.
55.4	54.5	55.4	51.8	48.2	49.6	Gallabat.
						<b>West Sudan, 7°-13° N. :</b>
57.2	59.4	56.3	54.3	44.2	39.9	El-Obeid.
60.8	60.8	58.1	51.8	49.1	50.0	Kadugli.
64.4	64.9	65.3	64.4	—	—	Kafia Kingi, 1 yr.
67.8	52.9	66.2	58.6	53.6	47.5	Raga (1-2 yrs.).
63.5	63.5	55.4	62.6	53.6	50.9	Wau.



**TABLE IX**  
**MEAN MONTHLY RAINFALL**

	<i>Jan.</i> in.	<i>Feb.</i> in.	<i>Mar.</i> in.	<i>April.</i> in.	<i>May.</i> in.	<i>June.</i> in.
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	0·0	0·0	0·0	0·0	0·0	0·0
Merowe . . .	0·0	0·0	0·0	0·0	0·0	0·0
Atbara . . .	0·0	0·0	0·0	0·16	0·15	0·21
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	0·0	0·0	0·0	0·0	0·1	0·22
Wad Medani . . .	0·0	0·0	0·0	0·07	0·66	1·40
Dueim . . .	0·0	0·0	0·106	0·0	0·63	0·67
Roseires . . .	0·0	0·08	0·26	0·93	2·18	4·81
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . .	0·0	0·13	0·17	0·77	2·84	5·43
Doleib Hilla . . .	0·0	0·29	0·28	0·56	2·73	5·59
Gambeila . . .	0·28	0·41	1·54	3·52	5·87	6·26
Mongalla . . .	0·14	0·80	1·63	4·00	5·24	4·26
Nimule . . .	0·29	1·10	2·60	3·74	6·12	3·40
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . .	0·01	0·07	0·008	0·0	0·02	0·0
Port Sudan . . .	0·39	0·43	0·12	0·0	0·10	0·0
Suakin . . .	0·83	0·49	0·004	0·06	0·04	0·0
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . .	0·0	0·02	0·02	0·04	0·43	0·79
Gallabat . . .	0·0	0·004	0·21	0·19	1·03	3·71
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . .	0·0	0·0	0·14	0·06	0·32	1·11
Kadugli . . .	0·0	0·0	0·0	1·18	2·99	6·22
Kafia Kingi (4-7 years) . . .	0·0	0·0	0·28	1·77	2·91	5·04
Raga (2-4 years) . . .	0·0	0·20	0·35	0·98	4·80	4·68
Wau . . .	0·0	0·48	0·67	1·42	5·98	6·97

<i>July.</i> in.	<i>Aug.</i> in.	<i>Sept.</i> in.	<i>Oct.</i> in.	<i>Nov.</i> in.	<i>Dec.</i> in.	<i>Year.</i> in.	
0·0	0·0	0·0	0·0	0·0	0·0	0·0	<b>North Sudan, 16°-22° N. :</b>
0·0	0·0	0·028	0·004	0·024	0·0	0·056	Wadi Halfa.
1·02	1·99	0·59	0·09	0·0	0·0	4·2	Merowe.
							Atbara.
1·81	1·95	0·54	0·26	0·0	0·0	4·85	<b>Mid-Sudan, 10°-16° N. :</b>
4·90	4·70	2·90	0·66	0·04	0·0	15·33	Khartoum.
4·06	3·47	2·00	0·62	0·0	0·0	11·556	Wad Medani.
7·74	9·21	6·84	1·56	0·25	0·0	33·86	Dueim.
							Roseires.
5·98	5·78	3·97	4·01	0·25	0·0	29·3	<b>South Sudan, 8°-10° N. :</b>
6·90	7·53	4·43	2·21	0·64	0·0	31·16	Kodok.
6·42	10·94	7·03	3·08	2·35	0·71	48·4	Doleib Hilla.
4·69	6·24	3·52	4·80	2·01	0·27	37·6	Gambeila.
4·82	5·35	4·91	4·82	4·71	0·46	42·3	Mongalla.
							Nimule.
0·0	0·05	0·01	0·38	0·28	0·49	1·3	<b>Red Sea, 19°-21° N. :</b>
0·67	0·09	0·0	0·34	2·12	0·75	5·0	Dongonab.
0·20	0·20	0·0	1·26	3·34	1·98	8·4	Port Sudan.
							Suakin.
3·62	3·94	2·64	0·71	0·0	0·004	12·21	<b>East Sudan, 12°-16° N. :</b>
6·92	6·76	3·18	1·10	0·44	0·0	23·54	Kassala.
							Gallabat.
4·06	4·57	3·86	0·83	0·004	0·0	15·0	<b>West Sudan, 7°-13° N. :</b>
5·32	6·18	5·63	3·54	0·0	0·0	31·1	El-Obeid.
7·60	9·29	7·92	1·89	0·0	0·0	36·70	Kadugli.
9·09	10·0	6·22	2·65	0·30	0·0	39·26	Kafia Kingi (4-7 yrs.).
7·24	8·54	5·28	3·90	0·71	0·004	41·29	Raga (2-4 yrs.).
							Wau.

TABLE X

## MAXIMUM RAINFALL IN MONTH AND YEAR

	<i>Jan.</i> in.	<i>Feb.</i> in.	<i>Mar.</i> in.	<i>April.</i> in.	<i>May.</i> in.	<i>June.</i> in.
<b>North Sudan, 16°-22° N. :</b>						
Merowe . . . . .	0-0	0-0	0-0	0-0	0-0	0-0
Atbara . . . . .	0-0	0-0	Drops	0-98	0-68	0-94
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . . . .	Drops	Drops	Drops	Drops	0-95	0-65
Wad Medani . . . . .	0-0	0-0	0-0	0-40	2-10	3-90
Dueim . . . . .	0-0	0-0	1-18	0-08	2-64	1-58
Roseires . . . . .	0-0	0-59	1-30	2-58	2-95	7-48
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . . . .	Drops	1-02	0-47	2-04	6-06	9-13
Doleib Hilla . . . . .	0-0	2-83	1-85	2-46	4-52	8-01
Gambeila . . . . .	0-68	1-46	4-84	11-34	8-00	7-95
Mongalla . . . . .	0-71	3-70	4-33	6-54	11-50	8-62
Nimule . . . . .	2-03	4-24	5-54	8-33	10-41	5-68
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . . . .	0-05	0-38	0-04	0-0	0-06	0-0
Port Sudan . . . . .	1-57	2-83	0-78	0-0	0-70	0-0
Suakin . . . . .	1-94	3-44	0-2	0-0	0-71	0-12
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . . . .	0-0	0-33	0-32	0-22	1-95	2-85
Gallabat . . . . .	0-0	0-39	0-62	1-74	4-90	7-16
<b>West Sudan, 7°-13° N. :</b>						
El Obeid . . . . .	0-0	Drops	0-78	0-59	1-33	5-0
Kadugli . . . . .	0-0	0-0	0-0	3-43	4-02	7-52
Kafia Kingi . . . . .	0-0	0-0	0-71	4-09	4-25	6-14
Raga . . . . .	0-0	0-55	0-79	2-60	6-50	5-83
Wau . . . . .	0-0	2-44	2-68	3-78	9-37	11-15

<i>July.</i> in.	<i>Aug.</i> in.	<i>Sept.</i> in.	<i>Oct.</i> in.	<i>Nov.</i> in.	<i>Dec.</i> in.	<i>Year.</i> in.	
0.0	0.0	0.22	0.004	0.02	0.0	0.242	<b>North Sudan, 16°-22° N. :</b>
4.40	6.90	1.85	0.38	0.0	0.0	9.5	Merowe.
							Atbara.
4.6	7.3	1.09	0.5	0.0	0.0	8.9	<b>Mid-Sudan, 10°-16° N. :</b>
7.00	11.40	6.10	2.40	0.50	0.0	28.965	Khartoum.
8.07	8.58	3.98	2.17	0.08	0.0	23.856	Wad Medani.
10.35	14.50	7.64	2.67	1.30	0.0	35.00	Dueim.
							Roseires.
8.9	8.54	6.69	7.24	1.10	0.0	36.3	<b>South Sudan, 3°-10° N. :</b>
10.39	11.26	7.33	6.77	2.71	0.0	37.37	Kodok.
8.23	15.30	11.3	5.43	5.55	1.22	62.0	Doleib Hilla.
9.00	11.00	6.85	7.44	4.68	1.18	55.7	Gambeila.
7.90	10.54	8.92	7.92	7.20	1.67	58.2	Mongalla.
							Nimule.
0.0	0.22	0.06	1.89	1.37	1.05	3.5	<b>Red Sea, 19°-21° N. :</b>
3.50	0.60	0.0	0.92	4.13	1.97	10.7	Dongonab.
1.79	0.47	0.0	4.80	9.80	6.73	14.45	Port Sudan.
							Suakin.
7.18	9.23	5.21	2.31	0.16	0.06	15.83	<b>East Sudan, 12°-16° N. :</b>
10.72	12.95	11.17	4.65	0.43	0.0	45.45	Kassala.
							Gallabat.
6.38	6.65	8.78	2.16	0.04	0.0	22.10	<b>West Sudan, 7°-13° N. :</b>
9.50	6.89	9.06	5.71	0.0	0.0	34.9	El-Obeid.
9.05	11.05	10.50	3.28	Drops	0.0	39.8	Kadugli.
10.60	13.20	8.23	3.78	0.39	0.0	—	Kafia Kingi.
12.61	13.00	7.84	5.67	3.88	0.04	54.0	Raga.
							Wau

TABLE XI

## MAXIMUM RAINFALL IN 24 HOURS

	<i>Jan.</i> in.	<i>Feb.</i> in.	<i>Mar.</i> in.	<i>April.</i> in.	<i>May.</i> in.	<i>June.</i> in.
<b>North Sudan, 16°-22° N. :</b>						
Merowe . . .	0·0	0·0	0·0	0·0	0·0	0·0
Atbara . . .	0·0	0·0	Drops	0·98	0·47	0·90
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	Drops	Drops	Drops	Drops	0·77	0·91
Wad Medani . . .	0·0	0·0	0·0	0·41	1·73	2·05
Dueim . . .	0·0	0·0	1·18	0·08	1·58	0·98
Roseires . . .	0·0	0·59	1·30	1·77	1·20	2·72
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . .	Drops	0·63	0·32	0·75	1·89	3·27
Doleib Hilla . . .	0·0	0·26	0·23	0·45	1·29	1·84
Gambeila . . .	0·67	0·51	2·87	4·05	2·79	2·75
Mongalla . . .	0·18	2·24	1·34	2·84	3·50	1·93
Nimule . . .	0·81	2·28	2·42	2·70	2·50	2·30
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . .	0·05	0·38	0·04	0·0	0·06	0·0
Port Sudan . . .	1·40	2·50	0·78	0·0	0·39	0·0
Suakin . . .	2·55	2·48	0·20	0·35	0·49	0·12
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . .	0·0	0·32	0·31	0·22	1·08	1·44
Gallabat . . .	0·0	0·04	0·79	0·47	0·79	1·97
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . .	0·0	Drops	0·78	0·59	0·87	2·20
Kadugli . . .	0·0	0·0	0·0	2·68	2·20	2·40
Kafia Kingi . . .	0·0	0·0	0·71	1·34	1·69	2·16
Raga . . .	0·0	0·39	0·78	0·87	2·05	3·31
Wau . . .	0·0	0·98	1·42	1·65	2·87	3·38

<i>July</i> in.	<i>Aug.</i> in.	<i>Sept.</i> in.	<i>Oct.</i> in.	<i>Nov.</i> in.	<i>Dec.</i> in.
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0.0	0.0	0.12	0.004	0.02	0.0
2.1	1.89	1.26	0.38	0.0	0.0

**North Sudan, 16°-22° N. :**

Merowe.

Atbara.

**Mid-Sudan, 10°-16° N. :**

2.40	2.20	1.97	0.50	0.0	0.0
2.56	3.58	3.39	2.07	0.47	0.0
2.95	3.07	1.85	1.28	0.08	0.0
2.60	3.07	2.76	1.65	0.83	0.0

Khartoum.

Wad Medani.

Dueim.

Roseires.

2.84	3.27	1.89	2.40	1.10	0.0
2.54	2.04	1.65	1.84	0.32	0.0
2.40	5.0	4.36	1.48	2.72	0.59
2.50	2.54	2.13	1.65	2.01	2.91
3.30	2.53	6.20	3.28	2.68	1.04

**South Sudan, 3°-10° N. :**

Kodok.

Doleib Hilla.

Gambeila.

Mongalla.

Nimule.

0.0	0.22	0.06	1.58	1.37	0.86
2.05	0.31	0.0	0.47	2.32	1.06
1.67	1.50	0.0	3.15	5.20	4.0

**Red Sea, 19°-21° N. :**

Dongonab.

Port Sudan.

Suakin.

2.36	2.85	3.27	2.0	0.16	0.06
2.64	3.39	1.73	1.69	0.98	0.0

**East Sudan, 12°-16° N. :**

Kassala.

Gallabat.

2.65	2.58	2.87	1.54	0.04	0.0
4.02	3.15	3.86	2.13	0.0	0.0
1.88	2.75	1.93	1.65	0.0	0.0
3.94	2.79	2.84	1.14	0.39	0.0
2.84	2.64	2.28	2.60	2.75	0.04

**West Sudan, 7°-13° N. :**

El-Obeid.

Kadugli.

Kafia Kingi.

Raga.

Wau.

TABLE XII

## MEAN NUMBER OF RAIN DAYS

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	0·0	0·0	0·0	0·0	0·0	0·0
Merowe . . .	0·0	0·0	0·0	0·0	0·0	0·0
Atbara . . .	0·0	0·0	0·0	0·2	0·8	0·8
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	0·0	0·0	0·0	0·0	0·8	0·9
Wad Medani . . .	0·0	0·0	0·0	0·3	1·9	4·1
Dueim . . .	0·0	0·0	0·1	0·1	1·3	1·7
Roseires . . .	0·0	0·1	0·4	2·0	6·4	12·0
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . .	0·0	0·25	1·0	2·4	6·5	10·1
Doleib Hilla . . .	0·0	0·2	1·0	1·4	6·4	10·0
Gambeila . . .	1·3	2·1	4·7	6·8	14·0	16·0
Mongalla . . .	1·0	2·3	6·0	8·9	12·2	10·5
Nimule . . .	0·7	2·1	4·3	7·0	9·9	7·2
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . .	0·2	0·2	0·2	0·0	0·4	0·0
Port Sudan . . .	1·9	0·7	0·1	0·0	0·3	0·0
Suakin . . .	3·0	1·2	0·3	0·3	0·4	0·2
<b>East Sudan, 12°-16° N.</b>						
Kassala . . .	0·0	0·1	0·1	0·3	2·0	3·3
Gallabat . . .	0·0	0·1	0·7	1·2	5·6	10·4
<b>West Sudan, 7°-13° N.</b>						
El-Obeid . . .	0·0	0·0	0·3	0·2	1·5	3·8
Kadugli . . .	0·0	0·0	0·0	1·0	3·0	7·0
Kafia Kingi . . .	0·0	0·0	1·0	3·5	4·7	10·0
Raga . . .	0·0	0·7	1·3	3·3	9·7	7·0
Wau . . .	0·0	1·6	2·6	5·0	11·9	11·8

<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Year.</i>	
0.0	0.0	0.0	0.0	0.0	0.0	0.0	<b>North Sudan, 16°-22° N. :</b>
0.0	0.0	0.4	0.0	0.1	0.0	0.5	Wadi Halfa.
2.2	2.8	1.8	0.7	0.0	0.0	9.3	Merowe.
							Atbara.
4.5	4.6	2.4	1.0	0.0	0.0	14.2	<b>Mid-Sudan, 10°-16° N. :</b>
8.5	9.2	6.3	2.3	0.3	0.0	32.6	Khartoum.
7.0	6.7	5.7	1.7	0.1	0.0	22.5	Wad Medani.
15.6	16.6	11.4	5.2	1.0	0.0	70.7	Dueim.
							Roseires.
13.3	12.6	10.2	7.2	0.5	0.0	64.0	<b>South Sudan, 3°-10° N. :</b>
11.7	13.4	9.9	6.4	1.6	0.0	62.0	Kodok.
14.0	16.0	12.0	10.0	4.6	3.3	104.8	Doleib Hilla.
11.1	12.6	7.2	9.0	6.0	2.2	89.0	Gambeila.
9.0	8.9	7.8	8.0	6.4	1.0	72.3	Mongalla.
							Nimule.
0.0	0.4	0.2	1.0	0.6	2.4	5.6	<b>Red Sea, 19°-21° N. :</b>
1.4	0.4	0.0	1.6	5.6	2.9	15.0	Dongonab.
0.8	0.6	0.0	1.7	5.9	4.7	19.0	Port Sudan.
							Suakin.
9.0	8.0	6.7	1.7	0.1	0.1	31.4	<b>East Sudan, 12°-16° N. :</b>
14.2	12.4	7.4	4.1	0.9	0.0	57.0	Kassala.
							Gallabat.
10.5	10.0	8.2	2.2	0.1	0.0	36.8	<b>West Sudan, 7°-13° N. :</b>
7.0	9.0	8.0	5.0	0.0	0.0	40.0	El-Obeid.
11.0	12.3	12.1	4.4	0.0	0.0	59.0	Kadugli.
12.0	16.0	15.0	7.8	0.7	0.0	73.5	Kafia Kingi.
12.7	14.7	11.6	10.3	2.2	0.1	84.5	Raga.
							Wau.



TABLE XIII

## MEAN RELATIVE HUMIDITY

	<i>Jan.</i> %	<i>Feb.</i> %	<i>Mar.</i> %	<i>April.</i> %	<i>May.</i> %	<i>June.</i> %
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	46	37	31	24	20	22
Merowe . . .	29	23	14	13	12	12
Atbara. . .	41	37	27	21	23	26
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	31	26	20	20	24	34
Wad Medani . . .	37	26	18	16	26	40
Dueim . . .	31	29	20	16	27	42
Roseires . . .	39	33.5	27.5	29	44.5	66
<b>South Sudan, 8°-10° N. :</b>						
Kodok . . .	30	35	34	48	61	64
Doleib Hilla . . .	39	32	31	43	66	76
Gambeila (8 a.m.) . . .	55	47.5	47.5	61.5	71	75.7
Mongalla . . .	56	56	56	71	78	82
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . .	74	73	68	64	61	48
Port Sudan . . .	67	66	65	62	58	47
Suakin. . .	71	73	74	71	64	52
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . .	45	42	36	27	31	40
Gallabat . . .	26	24	25	24	38	56
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . .	28	25	21	25	29	45
Kadugli (8 a.m.) . . .	20	17	15	25	54	70
Kafia Kingi (8 a.m., 2-3 years)	18	13	22	36	70	68
Wau (8 a.m.) . . .	47	46	50	61	74	79

<i>July.</i> %	<i>Aug.</i> %	<i>Sept.</i> %	<i>Oct.</i> %	<i>Nov.</i> %	<i>Dec.</i> %	<i>Year.</i> %	
26	31	34	37	42	49	33	<b>North Sudan, 16°-22° N. :</b>
23	27	21	22	26	31	21	Wadi Halfa.
39	42	39	36	40	42	34	Merowe.
							Atbara.
49	55	46	35	30	32	33	<b>Mid-Sudan, 10°-16° N. :</b>
58	62	58	44	31	34	37	Khartoum.
63	68	61	43	30	31	38	Wad Medani.
78.5	83.5	81	72.5	54	47	55	Dueim.
							Roseires.
84	86	83	78	56	39	58	<b>South Sudan, 3°-10° N. :</b>
85	86	82	80	60	36	60	Kodok.
77	80.5	74	67.5	65	62	65	Doleib Hilla.
85	85	81	78	74	64	72	Gambeila (8 a.m.).
							Mongalla.
55	53	56	69	69	70	63	<b>Red Sea, 19°-21° N. :</b>
48	46	54	69	70	67	60	Dongonab.
46	50	54	68	72	73	64	Port Sudan.
							Suakin.
56	64	58	43	41	48	44	<b>East Sudan, 12°-16° N. :</b>
70	77	73	60	40	30	45	Kassala.
							Gallabat.
64	73	67	48	32	31	39	<b>West Sudan, 7°-13° N. :</b>
78	80	82	65	29	21	47	El-Obeid.
82	85	82	75	45	34	52	Kadugli (8 a.m.).
							Kafia Kingi (8 a.m.,
							2-3 yrs.).
85	86	83	80	70	51	68	Wau (8 a.m.).

TABLE XIV

## MEAN VAPOUR PRESSURE

	<i>Jan.</i> mm.	<i>Feb.</i> mm.	<i>Mar.</i> mm.	<i>April.</i> mm.	<i>May.</i> mm.	<i>June.</i> mm.
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	5.9	5.2	5.6	6.1	6.6	7.6
Merowe . . .	5.0	4.2	3.0	3.8	4.4	4.7
Atbara . . .	7.3	7.2	6.4	6.1	8.4	10.0
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	6.0	5.6	5.3	6.2	8.8	11.5
Wad Medani . . .	7.3	5.6	4.7	5.1	8.9	12.9
Dueim . . .	6.0	6.1	4.9	5.3	9.4	13.5
Roseires . . .	8.9	8.3	8.2	9.2	13.7	16.7
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . .	6.9	9.4	10.0	13.7	15.9	17.6
Doleib Hilla . . .	8.6	7.9	8.8	12.9	18.0	18.4
Gambeila (8 a.m.) . . .	13.25	12.1	13.4	16.5	17.5	17.6
Mongalla . . .	14.1	14.7	14.7	17.5	18.7	19.1
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . .	14.6	15.1	15.0	16.6	18.9	17.3
Port Sudan . . .	15.0	14.8	15.1	16.6	17.9	17.0
Suakin . . .	15.6	15.5	16.8	18.6	20.3	19.3
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . .	9.4	9.8	9.7	9.4	11.4	12.7
Gallabat . . .	6.5	6.7	8.5	8.4	12.0	14.4
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . .	4.7	4.4	4.7	7.6	9.8	12.5
Kadugli (8 a.m.) . . .	4.5	3.4	3.7	7.4	14.7	17.3
Kafia Kingi (8 a.m., 2-3 years)	4.0	2.7	5.4	10.0	15.7	15.7
Wau (8 a.m.) . . .	9.6	10.9	13.0	16.4	18.6	18.4

<i>July.</i> mm.	<i>Aug.</i> mm.	<i>Sept.</i> mm.	<i>Oct.</i> mm.	<i>Nov.</i> mm.	<i>Dec.</i> mm.	<i>Year.</i> mm.	
9.1	10.4	10.5	10.1	7.7	6.9	7.6	<b>North Sudan, 16°-22° N. :</b>
8.1	9.3	7.5	7.0	6.4	5.5	5.8	Wadi Halfa.
13.0	13.9	13.2	11.1	10.0	8.0	9.6	Merowe.
							Atbara.
14.3	15.9	14.4	11.0	8.1	6.6	9.5	<b>Mid-Sudan, 10°-16° N. :</b>
15.7	16.6	16.2	13.1	8.4	7.2	10.1	Khartoum.
17.1	18.0	17.0	12.8	8.0	6.3	10.8	Wad Medani.
17.7	18.2	18.2	17.2	13.3	10.4	13.3	Dueim.
							Roseires.
18.3	19.0	19.0	18.3	13.3	9.3	12.8	<b>South Sudan, 8°-10° N. :</b>
19.0	19.5	19.7	19.7	14.3	8.3	14.6	Kodok.
17.5	17.9	17.6	17.4	16.2	15.75	16.1	Doleib Hilla.
18.7	18.7	18.6	17.8	17.2	14.9	17.1	Gambeila (8 a.m.).
							Mongalla.
20.7	20.4	19.7	20.7	18.4	15.4	17.7	<b>Red Sea, 19°-21° N. :</b>
19.0	18.5	19.2	21.4	19.2	16.0	17.5	Dongonab.
19.5	20.5	20.1	21.5	19.6	17.0	18.7	Port Sudan.
							Suakin.
15.4	16.6	16.3	13.5	12.0	10.8	12.2	<b>East Sudan, 12°-16° N. :</b>
16.1	17.0	17.3	15.4	10.5	7.4	11.7	Kassala.
							Gallabat.
16.2	17.5	16.5	11.9	7.2	5.5	9.8	<b>West Sudan, 7°-13° N. :</b>
17.8	18.2	18.3	14.9	6.8	4.3	11.6	El-Obeid.
18.5	17.0	17.4	15.5	8.7	6.4	11.4	Kadugli (8 a.m.)
							Kafia Kingi (8 a.m.,
							2-3 yrs.).
18.5	18.4	18.1	18.3	15.75	10.5	14.7	Wau.

TABLE XV

## MEAN DAILY EVAPORATION

	Jan. in.	Feb. in.	Mar. in.	April. in.	May. in.	June. in.
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . . . .	0.359	0.403	0.548	0.699	0.819	<b>0.846</b>
Merowe . . . . .	0.433	0.520	0.630	0.760	0.830	<b>0.870</b>
Atbara . . . . .	0.530	0.610	0.710	0.770	<b>0.780</b>	0.720
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . . . .	0.388	0.480	0.570	<b>0.630</b>	0.625	0.590
Wad Medani . . . . .	0.494	0.588	0.665	<b>0.742</b>	0.687	0.540
Dueim . . . . .	0.640	0.668	<b>0.747</b>	0.732	0.651	0.558
Roseires . . . . .	0.510	0.571	<b>0.634</b>	0.583	0.464	0.316
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . . . .	0.780	<b>0.781</b>	0.756	0.601	0.509	0.345
Gambeila . . . . .	0.365	0.466	<b>0.495</b>	0.374	0.236	0.164
Mongalla . . . . .	<b>0.530</b>	0.510	0.430	0.275	0.180	0.150
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . . . .	0.302	0.329	0.338	0.362	0.423	<b>0.583</b>
Port Sudan . . . . .	0.265	0.255	0.282	0.314	<b>0.332</b>	0.480
Suakin . . . . .	0.200	0.187	0.200	0.210	0.248	0.406
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . . . .	0.374	0.417	0.498	<b>0.592</b>	0.562	0.485
Gallabat . . . . .	0.475	0.547	0.593	<b>0.595</b>	0.475	0.315
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . . . .	0.542	0.634	<b>0.697</b>	0.673	0.667	0.552
Kadugli (3 years) . . . . .	0.635	0.751	<b>0.921</b>	0.727	0.395	0.252
Kafia Kingi (2 years) . . . . .	<b>0.650</b>	0.638	0.639	0.624	0.264	0.321
Wau . . . . .	0.478	0.515	<b>0.592</b>	0.375	0.254	0.192

<i>July.</i> in.	<i>Aug.</i> in.	<i>Sept.</i> in.	<i>Oct.</i> in.	<i>Nov.</i> in.	<i>Dec.</i> in.	<i>Year.</i> in.	
0.762	0.733	0.745	0.662	0.504	0.352	0.619	<b>North Sudan, 16°-22° N. :</b>
0.650	0.640	0.700	0.630	0.520	0.410	0.640	Wadi Halfa.
0.640	0.650	0.590	0.590	0.570	0.510	0.640	Merowe.
							Atbara.
							<b>Mid-Sudan, 10°-16° N. :</b>
0.460	0.390	0.410	0.500	0.460	0.400	0.480	Khartoum.
0.366	0.270	0.317	0.421	0.558	0.518	0.514	Wad Medani.
0.370	0.278	0.291	0.472	0.689	0.622	0.560	Dueim.
0.191	0.157	0.175	0.236	0.402	0.488	0.395	Roseires.
							<b>South Sudan, 8°-10° N. :</b>
0.201	0.163	0.164	0.203	0.465	0.681	0.471	Kodok.
0.137	0.150	0.154	0.193	0.235	0.264	0.252	Gambeila.
0.130	0.120	0.160	0.215	0.280	0.380	0.275	Mongalla.
							<b>Red Sea, 19°-21° N. :</b>
0.554	0.505	0.480	0.278	0.255	0.293	0.392	Dongonab.
0.494	0.483	0.384	0.233	0.269	0.260	0.337	Port Sudan.
0.498	0.431	0.298	0.172	0.187	0.186	0.268	Suakin.
							<b>East Sudan, 12°-16° N. :</b>
0.370	0.266	0.273	0.374	0.394	0.321	0.410	Kassala.
0.166	0.097	0.109	0.176	0.313	0.405	0.360	Gallabat.
							<b>West Sudan, 7°-13° N. :</b>
0.378	0.264	0.271	0.477	0.539	0.496	0.520	El-Obeid.
0.158	0.118	0.131	0.228	0.471	0.554	0.429	Kadugli (3 yrs.).
0.214	0.185	0.177	0.296	0.528	0.639	0.431	Kafia Kingi (2 yrs.).
0.157	0.143	0.175	0.203	0.327	0.316	0.313	Wau.

TABLE XVI

## MAXIMUM MEAN DAILY EVAPORATION FOR ANY MONTH

	<i>Jan.</i> in.	<i>Feb.</i> in.	<i>Mar.</i> in.	<i>April.</i> in.	<i>May.</i> in.	<i>June.</i> in.
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	0.413	0.469	0.613	0.783	0.861	<b>0.943</b>
Merowe . . .	0.560	0.660	0.740	0.950	1.020	<b>1.280</b>
Atbara . . .	0.750	0.780	0.830	<b>1.020</b>	0.980	0.960
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	0.540	0.590	0.710	0.800	<b>0.870</b>	0.660
Wad Medani . . .	0.630	0.800	0.913	<b>1.007</b>	0.857	0.612
Dueim . . .	0.744	0.735	0.766	<b>0.781</b>	0.726	0.709
Roseires . . .	0.555	0.658	<b>0.665</b>	0.626	0.540	0.488
<b>South Sudan, 8°-10° N. :</b>						
Kodok . . .	<b>1.06</b>	1.04	1.0	0.89	0.639	0.390
Gambeila . . .	0.410	0.50	<b>0.520</b>	<b>0.520</b>	0.300	0.190
Mongalla . . .	0.665	<b>0.790</b>	<b>0.470</b>	0.320	0.220	0.180
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . .	0.401	0.403	0.379	0.418	<b>0.655</b>	<b>0.634</b>
Port Sudan . . .	0.350	0.310	0.360	0.390	0.410	0.560
Suakin . . .	0.254	0.206	0.242	0.246	0.338	0.472
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . .	0.442	0.470	0.558	0.667	<b>0.670</b>	0.534
Gallabat . . .	0.558	<b>0.700</b>	0.673	0.647	0.554	0.039
<b>West Sudan, 7°-16° N. :</b>						
El-Obeid . . .	0.671	0.839	0.855	<b>0.894</b>	0.780	0.626
Kadugli . . .	0.666	0.809	<b>1.048</b>	0.830	0.467	0.259
Kafia Kingi . . .	<b>0.689</b>	0.685	0.662	0.677	0.264	0.476
Wau . . .	0.623	0.650	<b>0.763</b>	0.446	0.316	<b>0.244</b>

<i>July.</i> in.	<i>Aug.</i> in.	<i>Sept.</i> in.	<i>Oct.</i> in.	<i>Nov.</i> in.	<i>Dec.</i> in.	<i>Year.</i> in.	
0.804	0.820	0.806	0.744	0.539	0.399	0.633	<b>North Sudan, 16°-22° N. :</b>
0.810	0.830	0.760	0.730	0.660	0.510	0.660	Wadi Halfa.
0.850	0.870	0.700	0.800	0.700	0.670	0.780	Merowe.
							Atbara.
0.610	0.490	0.510	0.620	0.580	0.550	0.600	<b>Mid-Sudan, 10°-16° N. :</b>
0.431	0.299	0.374	0.502	0.650	0.651	0.622	Khartoum.
0.504	0.329	0.363	0.625	0.766	0.693	0.622	Wad Medani.
0.295	0.234	0.270	0.280	0.450	0.530	0.433	Dueim.
							Roseires.
0.268	0.209	0.244	0.296	0.693	0.886	0.590	<b>South Sudan, 3°-10° N. :</b>
0.150	0.140	0.190	0.220	0.250	0.290	0.290	Kodok.
0.150	0.150	0.185	0.320	0.380	0.465	0.330	Gambeila.
							Mongalla.
0.622	0.585	0.650	0.358	0.300	0.347	—	<b>Red Sea, 19°-21° N. :</b>
0.620	0.540	0.480	0.300	0.350	0.330	0.380	Dongonab.
0.660	0.559	0.336	0.213	0.236	0.247	0.320	Port Sudan.
							Suakin.
0.514	0.384	0.317	0.427	0.465	0.358	0.430	<b>East Sudan, 12°-16° N. :</b>
0.213	0.110	0.140	0.199	0.338	0.514	0.390	Kassala.
							Gallabat.
0.528	0.350	0.339	0.540	0.654	0.624	0.611	<b>West Sudan, 7°-16° N. :</b>
0.211	0.140	0.158	0.243	0.529	0.618	0.451	El-Obeid.
0.248	0.213	0.190	0.311	0.553	0.696	—	Kadugli.
0.204	0.194	0.217	0.240	0.396	0.518	0.354	Kafia Kingi.
							Wau.



TABLE XVII

## MAXIMUM EVAPORATION IN 24 HOURS (1906-12)

	<i>Jan.</i> in.	<i>Feb.</i> in.	<i>Mar.</i> in.	<i>April.</i> in.	<i>May.</i> in.	<i>June.</i> in.
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	0.591	0.709	0.815	1.102	1.284	1.323
Merowe . . .	0.965	0.901	0.953	1.126	1.251	1.118
Atbara . . .	1.181	1.063	1.181	1.516	1.535	1.102
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	0.677	0.822	1.142	1.032	1.268	0.922
Wad Medani . . .	0.787	1.260	1.476	1.535	1.398	0.926
Dueim . . .	0.787	0.787	0.787	0.787	0.787	0.787
Roseires . . .	0.748	0.787	0.996	0.866	0.717	0.650
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . .	1.457	1.693	1.551	1.488	1.102	0.807
Mongalla . . .	0.866	0.984	0.945	0.729	0.354	0.335
<b>Red Sea, 19°-21° N. :</b>						
Port Sudan . . .	0.729	0.669	0.658	0.611	0.677	0.847
Suakin . . .	0.599	0.433	0.449	0.394	0.575	0.669
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . .	0.787	0.764	0.787	0.827	0.787	0.685
Gallabat . . .	0.748	0.787	0.807	0.787	0.787	0.650
<b>West Sudan, 7°-16° N. :</b>						
El-Obeid . . .	0.787	1.260	1.181	1.102	1.216	0.996
Wau . . .	0.984	0.984	0.984	0.650	0.520	0.422

<i>July.</i> in.	<i>Aug.</i> in.	<i>Sept.</i> in.	<i>Oct.</i> in.	<i>Nov.</i> in.	<i>Dec.</i> in.	
1.110	1.133	1.142	0.945	0.779	0.733	<b>North Sudan, 16°-22° N. :</b>
1.212	1.063	1.091	0.953	0.729	0.567	Wadi Halfa.
1.091	1.024	0.906	0.807	0.945	0.795	Merowe.
						Atbara.
0.776	0.721	0.662	0.858	0.768	0.685	<b>Mid-Sudan, 10°-16° N. :</b>
0.654	0.524	0.630	0.851	0.764	0.740	Khartoum.
0.787	0.748	0.551	0.787	0.787	0.787	Wad Medani.
0.492	0.335	0.308	0.422	0.630	0.709	Dueim.
						Roseires.
0.512	0.335	0.374	0.591	1.181	1.406	<b>South Sudan, 3°-10° N. :</b>
0.300	0.441	0.414	0.472	0.748	0.748	Kodok.
						Mongalla.
0.847	0.847	0.768	0.551	0.827	0.520	<b>Red Sea, 19° N.-21° N. :</b>
0.843	0.847	0.571	0.268	0.414	0.394	Port Sudan.
						Suakin.
0.630	0.516	0.748	0.630	0.689	0.571	<b>East Sudan, 12°-16° N. :</b>
0.472	0.201	0.197	0.354	0.500	0.709	Kassala.
						Gallabat.
1.040	0.704	0.591	0.984	1.024	0.827	<b>West Sudan, 7°-16° N. :</b>
0.354	0.284	0.315	0.414	0.638	0.709	El-Obeid.
						Wau.

TABLE XVIII

## MINIMUM EVAPORATION IN 24 HOURS (1906-12)

	<i>Jan.</i> in.	<i>Feb.</i> in.	<i>Mar.</i> in.	<i>April.</i> in.	<i>May.</i> in.	<i>June.</i> in.
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	0·079	0·197	0·308	0·358	0·532	0·544
Merowe . . .	0·264	0·311	0·374	0·433	0·449	0·484
Atbara . . .	0·157	0·157	0·236	0·394	0·362	0·240
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	0·079	0·039	0·059	0·107	0·110	0·134
Wad Medani . . .	0·296	0·346	0·480	0·480	0·339	0·165
Dueim . . .	0·472	0·394	0·496	0·418	0·276	0·276
Roseires . . .	0·276	0·323	0·079	0·173	0·197	0·110
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . .	0·276	0·394	0·095	0·079	0·039	0·059
Mongalla . . .	0·205	0·020	0·157	0·079	0·039	0·039
<b>Red Sea, 19°-21° N. :</b>						
Port Sudan . . .	0·079	0·047	0·039	0·071	0·079	0·165
Suakin . . .	0·067	0·094	0·063	0·079	0·055	0·094
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . .	0·216	0·216	0·268	0·335	0·216	0·236
Gallabat . . .	0·252	0·276	0·157	0·240	0·157	0·126
<b>West Sudan, 7°-16° N. :</b>						
El-Obeid . . .	0·299	0·390	0·216	0·000	0·304	0·126
Wau . . .	0·252	0·252	0·091	0·079	0·059	0·039

<i>July.</i> in.	<i>Aug.</i> in.	<i>Sept.</i> in.	<i>Oct.</i> in.	<i>Nov.</i> in.	<i>Dec.</i> in.	
0.551	0.512	0.394	0.433	0.276	0.197	<b>North Sudan, 16°-22° N. :</b>
0.244	0.256	0.276	0.304	0.346	0.252	Wadi Halfa.
0.217	0.039	0.157	0.276	0.225	0.276	Merowe.
						Atbara.
						<b>Mid-Sudan, 10°-16° N.</b>
0.110	0.059	0.134	0.138	0.126	0.099	Khartoum.
0.047	0.087	0.130	0.070	0.453	0.362	Wad Medani.
0.079	0.079	0.157	0.079	0.433	0.492	Dueim.
0.051	0.039	0.039	0.000	0.205	0.315	Roseires.
						<b>South Sudan, 3°-10° N.</b>
0.039	0.051	0.039	0.079	0.118	0.216	Kodok.
0.028	0.039	0.039	0.020	0.039	0.063	Mongalla.
						<b>Red Sea, 19°-21° N. :</b>
0.118	0.173	0.150	0.032	0.098	0.067	Port Sudan.
0.181	0.157	0.130	0.059	0.079	0.079	Suakin.
						<b>East Sudan, 12°-16° N. :</b>
0.098	0.039	0.118	0.118	0.177	0.157	Kassala.
0.039	0.012	0.012	0.079	0.177	0.157	Gallabat.
						<b>West Sudan, 7°-16° N. :</b>
0.130	0.079	0.091	0.118	0.335	0.276	El-Obeid.
0.039	0.008	0.059	0.051	0.102	0.102	Wau.

TABLE XIX

CLOUD, MEAN OF THE DAY (SCALE 0-10)

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	1.0	1.2	0.8	0.7	0.6	0.1
Merowe . . .	0.7	0.9	1.4	0.8	1.3	1.2
Atbara. . . . .	0.2	0.46	0.8	0.6	1.0	1.0
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	0.55	0.85	1.1	1.1	2.4	3.0
Wad Medani . . .	0.6	0.7	0.9	1.1	2.2	3.1
Dueim . . . . .	0.1	0.3	0.4	0.5	1.6	2.1
Roseires . . . . .	0.5	1.0	1.0	1.6	2.9	3.7
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . . . .	0.9	1.8	2.0	2.8	4.3	4.9
Doleib Hilla . . .	0.6	0.8	0.9	1.1	2.1	2.5
Garnbeila (8 a.m.) . .	1.75	2.1	3.3	3.45	4.5	5.3
Mongalla . . . . .	2.7	3.0	4.9	5.0	4.6	4.9
Nimule . . . . .	1.6	1.6	1.9	1.8	1.5	1.7
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . . . .	2.3	1.5	1.5	0.6	1.2	0.4
Port Sudan . . . .	3.9	3.0	2.0	1.0	0.9	0.9
Suakin. . . . .	5.0	4.7	3.0	1.5	1.4	1.6
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . . . .	0.97	1.2	1.6	1.6	2.2	3.3
Gallabat . . . . .	0.5	0.7	1.2	1.7	2.6	3.1
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . . . .	0.5	1.0	1.2	1.1	2.3	3.3
Kadugli (8 a.m.) . . .	0.0	0.0	0.3	0.2	0.7	1.6
Kafia Kingi (8 a.m., 2-3 years)	0.8	1.1	2.4	2.6	4.0	4.0
Wau (8 a.m.) . . . .	1.5	2.3	2.4	3.3	4.0	4.5

<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Year.</i>	
0.2	0.3	0.3	0.3	0.4	0.8	0.6	<b>North Sudan, 16°-22° N. :</b>
2.5	2.7	2.1	1.0	0.6	0.8	1.3	Wadi Halfa.
2.1	2.15	2.0	0.8	0.2	0.5	1.0	Merowe.
							Atbara.
4.5	4.1	3.6	2.2	0.7	0.5	2.0	<b>Mid-Sudan, 10°-16° N. :</b>
3.9	3.8	3.4	2.3	0.6	0.5	1.9	Khartoum.
4.1	4.0	3.3	2.1	0.4	0.2	1.6	Wad Medani.
4.7	4.8	3.6	2.3	0.9	0.5	2.3	Dueim.
							Roseires.
6.0	5.0	4.4	3.5	1.2	0.9	3.14	<b>South Sudan, 3°-10° N. :</b>
2.9	2.2	1.9	1.6	0.8	0.7	1.5	Kodok.
5.0	4.3	3.3	2.4	2.6	2.0	3.3	Doleib Hilla.
5.2	5.2	4.2	4.4	4.0	3.3	4.3	Gambeila (8 a.m.).
1.6	1.8	1.6	2.2	2.0	1.5	1.7	Mongalla.
							Nimule.
1.5	1.6	1.5	1.2	2.0	3.2	1.5	<b>Red Sea, 19°-21° N. :</b>
2.3	2.2	1.4	2.0	3.5	4.7	2.3	Dongonab.
3.1	2.8	1.8	3.0	5.0	4.7	3.1	Port Sudan.
							Suakin.
5.7	5.9	3.3	2.0	1.3	0.7	2.5	<b>East Sudan, 12°-16° N. :</b>
5.0	5.2	4.1	2.6	1.2	0.7	2.4	Kassala.
							Gallabat.
4.1	4.3	3.9	2.6	1.07	0.5	2.15	<b>West Sudan, 7°-13° N. :</b>
2.6	2.6	1.2	0.6	0.0	0.0	0.9	El-Obeid.
5.5	6.2	4.8	2.4	0.2	0.2	2.85	Kadugli (8 a.m.).
							Kafia Kingi (8 a.m.,
							2-3 years).
5.0	5.7	4.4	3.6	2.4	1.2	3.3	Wau (8 a.m.).

TABLE XX

## MEAN NUMBER OF THUNDERSTORMS (1908-12)

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	0-0	0-0	0-0	0-25	0-0	0-0
Merowe . . .	0-0	0-0	0-0	0-0	0-0	0-0
Atbara . . .	0-0	0-0	0-25	0-0	0-0	0-0
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	0-0	0-25	0-0	0-25	0-75	0-0
Roseires . . .	0-0	0-0	0-0	0-0	0-0	1-0
<b>South Sudan, 8°-10° N. :</b>	No records					
<b>Red Sea, 19°-21° N. :</b>	No records					
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . .	0-0	0-0	0-0	0-25	0-75	1-50
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . .	0-0	0-0	0-25	0-25	0-50	1-50
Wau . . .	0-0	0-25	2-25	2-25	0-0	0-0

<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Year.</i>	
0.0	0.0	0.0	0.0	0.0	0.0	0.25	<b>North Sudan, 16°-22° N. :</b>
0.5	0.5	0.0	0.25	0.0	0.0	1.25	Wadi Halfa.
0.0	0.75	0.5	0.0	0.0	0.0	1.5	Merowe.
							Atbara.
1.5	1.75	1.25	0.25	0.0	0.0	6.00	<b>Mid-Sudan, 10°-16° N. :</b>
0.0	1.75	0.75	0.0	0.0	0.0	3.50	Khartoum.
							Roseires.
							<b>South Sudan, 3°-10° N. :</b>
							No records
							<b>Red Sea, 19°-21° N. :</b>
							No records
4.25	3.00	2.80	1.75	0.0	0.0	14.30	<b>East Sudan, 12°-16° N. :</b>
							Kassala.
5.00	3.75	1.50	0.0	0.0	0.0	12.75	<b>West Sudan, 7°-13° N. :</b>
0.0	0.0	0.0	0.0	0.0	0.0	4.75	El-Obeid.
							Wau.



TABLE XXI

MEAN WIND STRENGTH (Scale, 0-10)

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
<b>North Sudan, 16°-22° N. :</b>						
Wadi Halfa . . .	2.03	1.95	2.23	2.3	2.2	2.25
Merowe . . .	2.15	2.3	2.47	2.7	2.4	2.1
Atbara . . .	1.5	1.7	1.5	1.5	1.4	1.5
<b>Mid-Sudan, 10°-16° N. :</b>						
Khartoum . . .	2.3	2.27	2.3	2.1	2.13	2.17
Wad Medani . . .	2.1	2.0	2.2	2.1	2.4	2.8
Dueim . . .	3.0	2.95	2.6	2.4	2.2	2.6
Roseires . . .	1.3	1.3	1.3	1.37	1.57	1.65
<b>South Sudan, 3°-10° N. :</b>						
Kodok . . .	3.25	3.35	2.95	2.65	2.97	3.15
Dolieb Hilla . . .	2.53	2.3	2.3	1.3	1.4	1.3
Gambeila . . .	3.25	2.6	2.6	2.3	2.5	1.95
Mongalla . . .	1.7	1.4	1.6	1.2	1.2	1.15
<b>Red Sea, 19°-21° N. :</b>						
Dongonab . . .	2.74	2.9	3.1	2.9	2.3	2.7
Port Sudan . . .	2.9	3.2	3.03	2.37	2.0	2.1
Suakin . . .	3.8	3.9	3.6	3.0	2.6	2.7
<b>East Sudan, 12°-16° N. :</b>						
Kassala . . .	1.73	1.77	1.9	1.8	1.75	1.95
Gallabat . . .	2.01	1.9	1.95	2.3	2.4	2.3
<b>West Sudan, 7°-13° N. :</b>						
El-Obeid . . .	2.5	2.35	2.3	1.13	2.2	2.9
Kadugli . . .	2.4	2.45	2.3	2.03	2.13	2.3
Kafia Kingi . . .	3.0	3.95	3.9	4.1	3.75	3.0
Wau . . .	2.57	2.5	2.5	2.7	2.37	2.51

<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Year.</i>	
2·1	2·0	2·4	2·37	2·1	2·0	2·1	<b>North Sudan, 16°-22° N. :</b>
2·1	1·9	2·2	2·1	2·0	2·0	2·2	Wadi Halfa.
1·9	1·7	1·3	1·34	1·28	1·42	1·5	Merowe.
							Atbara.
							<b>Mid-Sudan, 10°-16° N. :</b>
2·77	2·4	1·9	1·7	2·08	2·3	2·2	Khartoum.
2·6	2·3	2·2	1·93	2·05	2·23	2·23	Wad Medani.
2·4	2·0	1·9	1·87	2·2	2·6	2·37	Dueim.
1·55	1·4	1·4	1·36	1·23	1·5	1·4	Roseires.
							<b>South Sudan, 3°-10° N. :</b>
3·1	3·5	3·47	2·9	3·1	2·8	3·0	Kodok.
1·4	1·1	0·5	0·7	1·32	2·8	1·5	Dolieb Hilla.
2·2	1·9	3·5	3·7	3·5	3·52	2·8	Gambeila.
1·2	1·17	1·13	1·28	1·3	1·43	1·3	Mongalla.
							<b>Red Sea, 19°-21° N. :</b>
2·14	2·0	2·48	2·2	2·46	2·1	2·5	Dongonab.
2·1	2·2	2·07	2·1	2·63	2·6	2·47	Port Sudan.
3·4	2·8	2·3	2·6	3·3	3·7	3·2	Suakin.
							<b>East Sudan, 12°-16° N. :</b>
2·4	1·93	1·65	1·5	1·53	1·4	1·8	Kassala.
2·2	2·03	2·07	1·6	1·33	1·5	1·97	Gallabat.
							<b>West Sudan, 7°-13° N. :</b>
2·75	2·63	2·45	2·5	2·6	2·55	2·5	El-Obeid.
2·13	2·17	2·03	2·07	2·27	2·66	2·37	Kadugli.
2·87	2·77	2·4	2·5	2·63	3·2	3·35	Kafia Kingi.
2·4	2·1	1·97	2·48	2·6	2·8	2·45	Wau.

TABLE XXII

## MEAN WIND STRENGTH BY SEASONS (Scale 0-10)

	Winter (Dec.- Feb.).	Spring (Mar.- May).	Summer (June- Aug.).	Autumn (Sept.- Nov.).	Mean of Year.
<b>North Sudan, 16°-22° N. :</b>					
Wadi Halfa . . . .	2.0	2.24	2.12	<b>2.29</b>	2.1
Merowe . . . . .	2.15	<b>2.52</b>	2.03	2.10	2.2
Atbara . . . . .	1.51	1.50	<b>1.70</b>	1.31	1.5
<i>Mean</i> . . . . .	1.89	2.09	1.95	1.90	1.93
<b>Mid-Sudan, 10°-16° N. :</b>					
Khartoum . . . . .	2.29	2.18	<b>2.45</b>	1.89	2.2
Wad Medani . . . .	2.11	2.23	<b>2.57</b>	2.06	2.23
Dueim . . . . .	<b>2.85</b>	2.40	2.33	1.99	2.37
Roseires . . . . .	1.37	1.41	<b>1.53</b>	1.33	1.4
<i>Mean</i> . . . . .	2.15	2.05	2.22	1.82	2.05
<b>South Sudan, 3°-10° N. :</b>					
Kodok . . . . .	3.13	2.86	<b>3.25</b>	3.16	3.0
Dolieb Hilla . . . .	<b>2.54</b>	1.70	1.27	0.84	1.5
Gambeila . . . . .	3.12	2.47	2.02	<b>3.57</b>	2.8
Mongalla . . . . .	<b>1.51</b>	1.30	1.17	1.24	1.3
<i>Mean</i> . . . . .	2.57	2.08	1.93	2.20	2.15
<b>Red Sea, 19°-21° N. :</b>					
Dongonab . . . . .	2.58	<b>2.76</b>	2.28	2.38	2.5
Port Sudan . . . . .	<b>2.90</b>	2.47	2.13	2.27	2.47
Suakin . . . . .	<b>3.80</b>	3.07	2.97	<b>2.73</b>	3.2
<i>Mean</i> . . . . .	3.09	2.77	2.46	2.46	2.72
<b>East Sudan, 12°-16° N. :</b>					
Kassala . . . . .	1.63	1.82	<b>2.09</b>	1.56	1.8
Gallabat . . . . .	1.80	<b>2.22</b>	2.18	1.67	1.97
<i>Mean</i> . . . . .	1.71	2.02	2.13	1.62	1.88
<b>West Sudan, 7°-13° N. :</b>					
El-Obeid . . . . .	2.47	1.88	<b>2.76</b>	2.52	2.50
Kadugli . . . . .	<b>2.50</b>	2.15	2.20	2.12	2.37
Kafia Kingi . . . . .	3.38	<b>3.92</b>	2.88	2.51	3.35
Wau . . . . .	<b>2.62</b>	2.57	2.43	<b>2.35</b>	2.45
<i>Mean</i> . . . . .	2.74	2.63	2.57	2.37	2.67

TABLE XXIII

WINDS OF STRENGTH 7-10 (Scale 0-10) AT HOURS OF OBSERVATION  
PER 100 OBSERVATIONS PER MONTH, 1907-12

JANUARY									
	N.	NE.	E.	SE.	S.	SW.	W.	NW.	
Wadi Halfa . . .	1.08	—	—	—	—	—	—	0.22	
Khartoum . . .	—	—	—	—	—	—	—	—	
Kodok (4 years 1907-10) .	6.46	0.80	—	—	—	—	—	0.27	
Port Sudan . . .	0.18	1.26	—	—	—	—	—	—	
Suakin (2 years 1907-8) .	—	—	—	—	—	—	—	—	
Kassala . . .	—	—	—	—	—	—	—	—	
El-Obeid . . .	2.07	0.18	0.5	—	—	—	—	0.36	

FEBRUARY									
Wadi Halfa . . .	0.24	—	—	0.24	0.47	—	—	—	
Khartoum . . .	0.18	—	—	—	—	—	—	—	
Kodok . . .	4.42	1.48	—	—	—	—	—	—	
Port Sudan . . .	0.59	4.31	—	—	—	—	—	0.29	
Suakin . . .	—	—	—	—	—	—	—	—	
Kassala . . .	0.45	0.09	—	—	—	—	—	—	
El-Obeid . . .	1.57	0.59	—	—	—	—	—	—	

MARCH									
Wadi Halfa . . .	2.15	—	—	—	—	—	—	0.22	
Khartoum . . .	—	—	—	—	—	—	—	—	
Kodok . . .	2.97	0.54	—	—	—	0.27	0.27	0.13	
Port Sudan . . .	—	1.79	—	—	—	—	—	—	
Suakin . . .	0.54	0.54	—	—	—	—	—	0.54	
Kassala . . .	—	0.71	—	—	—	—	—	—	
El-Obeid . . .	0.98	0.36	—	—	—	—	—	0.09	

APRIL									
Wadi Halfa . . .	2.2	—	—	—	—	—	—	—	
Khartoum . . .	0.18	0.18	—	—	0.18	—	—	—	
Kodok . . .	—	0.29	0.29	0.29	—	—	—	—	
Port Sudan . . .	—	0.37	—	—	—	—	—	—	
Suakin . . .	0.82	1.10	—	—	—	—	0.55	0.82	
Kassala . . .	—	—	—	—	—	—	—	—	
El-Obeid . . .	0.18	0.18	—	—	—	—	—	—	

TABLE XXIII (*continued*)

WINDS OF STRENGTH 7-10 (Scale 0-10) AT HOURS OF OBSERVATION  
PER 100 OBSERVATIONS PER MONTH, 1907-12

MAY										
			N.	NE.	E.	SE.	S.	SW.	W.	NW.
Wadi Halfa	.	.	0.22	0.22	—	—	—	—	—	—
Khartoum	.	.	0.09	—	—	0.53	0.36	0.36	0.18	0.09
Kodok	.	.	0.27	0.54	—	0.27	—	0.54	—	—
Port Sudan	.	.	—	0.18	—	—	—	—	—	—
Suakin	.	.	—	—	—	—	—	—	—	—
Kassala	.	.	—	—	0.09	0.45	—	—	—	0.18
El-Obeid	.	.	0.18	0.18	0.36	0.18	0.90	0.18	0.54	—

JUNE										
Wadi Halfa	.	.	.	—	—	—	0.44	—	—	—
Khartoum	.	.	.	—	—	0.37	1.30	0.56	—	—
Kodok	.	.	.	0.86	0.29	0.29	1.44	0.57	1.15	0.29
Port Sudan	.	.	.	0.18	0.18	—	—	—	—	—
Suakin	.	.	.	0.82	2.93	0.55	—	—	0.55	3.30
Kassala	.	.	.	—	—	0.37	0.18	0.56	—	0.18
El-Obeid	.	.	.	0.92	0.18	—	0.18	2.22	1.48	0.92

JULY										
Wadi Halfa	.	.	.	0.43	0.22	—	—	—	—	—
Khartoum	.	.	.	—	—	—	—	1.66	0.92	—
Kodok	.	.	.	0.27	—	—	—	2.15	0.27	—
Port Sudan	.	.	.	—	—	0.18	0.18	—	—	—
Suakin	.	.	.	0.54	2.70	—	1.07	—	5.37	1.33
Kassala	.	.	.	—	—	—	—	0.54	0.54	—
El-Obeid	.	.	.	0.18	0.18	0.18	0.18	1.07	1.16	0.80

AUGUST										
Wadi Halfa	.	.	.	—	—	—	—	—	—	—
Khartoum	.	.	.	—	0.18	0.18	—	—	0.45	0.98
Kodok	.	.	.	0.36	—	2.15	—	2.5	0.36	—
Port Sudan	.	.	.	0.18	—	—	0.18	—	0.36	0.18
Suakin	.	.	.	—	0.54	—	—	—	2.70	0.54
Kassala	.	.	.	—	—	—	—	0.90	0.18	—
El-Obeid	.	.	.	—	—	—	—	0.54	1.80	0.18

## SEPTEMBER

	N.	NE.	E.	SE.	S.	SW.	W.	NW.
Wadi Halfa . . . . .	0.33	—	—	—	—	—	—	0.11
Khartoum . . . . .	—	—	—	0.09	0.64	0.27	0.09	—
Kodok . . . . .	0.4	—	—	—	—	—	—	—
Port Sudan . . . . .	—	0.18	0.18	—	—	—	—	0.18
Suakin . . . . .	—	0.55	—	—	—	—	—	—
Kassala . . . . .	—	—	0.18	—	—	0.18	—	—
El-Obeid . . . . .	—	—	0.18	—	0.36	0.90	0.18	—

## OCTOBER

Wadi Halfa . . . . .	1.08	—	—	—	—	—	—	—
Khartoum . . . . .	—	—	—	—	—	—	—	—
Kodok . . . . .	—	—	—	0.27	0.27	—	—	0.27
Port Sudan . . . . .	0.18	—	—	0.18	—	—	—	—
Suakin . . . . .	—	—	—	—	—	—	—	—
Kassala . . . . .	—	—	—	—	—	—	—	—
El-Obeid . . . . .	0.09	—	—	—	0.36	0.18	—	0.09

## NOVEMBER

Wadi Halfa . . . . .	0.66	—	—	—	—	—	—	—
Khartoum . . . . .	—	—	—	—	—	—	—	—
Kodok . . . . .	4.66	0.72	—	—	—	—	—	—
Port Sudan . . . . .	—	0.92	—	—	—	—	—	0.18
Suakin . . . . .	2.47	0.27	—	—	—	—	5.5	—
Kassala . . . . .	—	—	—	—	—	—	—	0.18
El-Obeid . . . . .	0.92	—	—	—	—	—	—	—

## DECEMBER

Wadi Halfa . . . . .	0.22	—	—	—	—	—	—	—
Khartoum . . . . .	—	—	—	—	—	—	—	—
Kodok . . . . .	4.98	1.21	—	—	—	—	—	—
Port Sudan . . . . .	0.36	1.26	—	—	—	—	—	—
Suakin . . . . .	2.14	—	—	—	—	—	—	4.8
Kassala . . . . .	—	—	—	—	—	—	—	—
El-Obeid . . . . .	1.43	—	—	—	—	—	—	—

TABLE XXIV

## WINDS. PERCENTAGE AND DIRECTION

\* = less than 0.1 per cent.

## JANUARY

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
<b>North Sudan, 16°-22° N. :</b>									
Wadi Halfa . . .	<b>48.4</b>	25.5	4.2	0.8	0.8	0.4	2.7	3.6	13.6
Merowe . . .	26.5	<b>51.0</b>	2.0	*	*	*	0.0	15.5	4.0
Berber and Atbara . .	<b>69.5</b>	13.5	2.1	0.1	0	0	2.0	10.2	2.6
<b>Mid-Sudan, 10°-16° N. :</b>									
Khartoum . . .	<b>70.2</b>	23.9	0.4	*	*	0.1	0.2	3.6	1.5
Wad Medani . . .	<b>48.9</b>	28.0	5.0	0.0	0.0	0.0	9.1	8.6	0.5
Dueim . . .	<b>73.9</b>	7.1	0.3	0.0	0.0	0.2	*	17.7	0.8
Roseires . . .	<b>59</b>	4.2	2.6	0.6	0.9	0.9	3.9	25.1	2.8
<b>South Sudan, 3°-10° N. :</b>									
Kodok . . .	<b>72.6</b>	15.9	0.0	0.0	0.2	0.2	0.2	2.0	8.9
Doleib Hill . . .	<b>65.2</b>	21.5	0.4	0.4	2.2	0.4	0.7	4.7	4.7
Gambeila . . .	0.4	4.8	11.3	<b>34.3</b>	6.0	9.7	14.9	4.8	13.7
Mongalla . . .	<b>21.4</b>	10.4	12.5	1.9	7.7	2.0	4.3	4.5	35.3
Nimule . . .	2.0	9.0	<b>79.0</b>	0.0	0.0	0.0	4.0	6.0	—
<b>Red Sea, 19°-21° N. :</b>									
Dongonab . . .	<b>34.1</b>	19.2	3.0	3.7	1.2	0.0	2.3	26.5	10.0
Port Sudan . . .	25.3	<b>53.7</b>	4.6	3.2	0.2	0.2	3.0	9.6	0.2
Suakin . . .	<b>35.4</b>	15.4	7.3	0.5	1.1	0.4	11.5	27.3	1.1
<b>East Sudan, 12°-16° N. :</b>									
Kassala . . .	<b>45.8</b>	26.6	7.9	3.0	4.2	0.3	1.0	2.6	8.6
Gallabat . . .	9.9	4.1	11.5	5.9	<b>18.4</b>	10.1	6.1	16.9	17.2
<b>West Sudan, 7°-13° N. :</b>									
El-Obeid . . .	<b>61.8</b>	22.4	5.4	0.1	0.4	0.0	0.7	9.2	0.0
Kadugli (2-3 years) . .	4.1	<b>38.3</b>	20.8	14.2	6.0	10.0	5.0	1.6	0.0
Kafia Kingi (8 a.m., 2 years) . . .	1.6	<b>38.6</b>	4.8	21.0	1.6	11.2	5.0	16.2	0.0
Wau . . .	<b>36.0</b>	13.7	7.4	10.5	2.0	5.6	0.4	19.6	4.8

## FEBRUARY

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
<b>North Sudan, 16°-22° N. :</b>									
Wadi Halfa . . .	42.4	34.0	2.8	1.6	0.9	0.4	4.5	4.2	9.1
Merowe . . .	26.0	48.0	1.5	*	1.5	1.5	1.0	16.5	4.0
Berber and Atbara . .	64.0	13.3	1.4	0.5	0.3	0.0	2.0	16.4	2.1
<b>Mid-Sudan, 10°-16° N. :</b>									
Khartoum . . .	62.7	26.0	1.2	0.2	0.0	0.2	0.4	5.4	3.9
Wad Medani . . .	51.4	25.8	4.5	0.0	0.0	0.2	8.4	7.5	2.3
Dueim . . .	70.2	8.3	0.2	0.0	0.2	0.2	0.1	19.2	1.6
Roseires . . .	51.7	3.2	1.2	0.8	5.3	0.7	5.4	27.8	4.0
<b>South Sudan, 3°-10° N. :</b>									
Kodok . . .	59.7	11.9	1.3	1.1	5.9	1.7	1.9	6.0	10.5
Doleib Hilla . . .	65.2	18.6	2.0	0.8	6.2	1.6	1.2	0.8	3.5
Gambeila . . .	1.9	0.9	8.8	31.7	8.4	5.1	20.5	5.6	16.8
Mongalla . . .	24.0	6.5	12.3	2.5	8.6	3.8	3.8	5.7	32.8
Nimule . . .	7.0	10.0	77.0	0.0	6.0	0.0	0.0	0.0	0.0
<b>Red Sea, 19°-21° N. :</b>									
Dongonab . . .	36.2	22.6	4.0	8.3	3.6	0.1	0.7	17.3	7.1
Port Sudan . . .	21.9	54.6	6.7	2.3	1.7	0.3	2.9	8.4	1.1
Suakin . . .	38.3	20.2	5.3	0.6	0.0	0.1	5.7	29.1	0.8
<b>East Sudan, 12°-16° N. :</b>									
Kassala . . .	44.7	20.8	8.9	4.0	6.4	1.7	1.1	5.5	6.9
Gallabat . . .	16.8	3.0	15.3	5.3	17.6	5.2	3.9	16.1	16.6
<b>West Sudan, 7°-13° N. :</b>									
El-Obeid . . .	68.5	19.1	5.4	0.1	0.6	0.2	0.6	5.3	0.2
Kadugli . . .	7.8	32.5	24.1	7.8	7.0	6.0	7.8	7.0	0.0
Kafia Kingi (8 a.m., 2 years) . . .	0.0	35.0	1.8	40.0	5.4	3.5	12.5	1.8	0.0
Wau . . .	28.7	16.5	2.0	15.2	4.6	13.0	0.2	15.4	4.4



TABLE XXIV (*continued*)

## WINDS. PERCENTAGE AND DIRECTION

\* = less than 0.1 per cent.

MARCH									
	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
<b>North Sudan, 16°-22° N. :</b>									
Wadi Halfa . . .	41.7	35.5	4.6	2.5	1.8	1.2	2.2	3.8	6.7
Merowe . . .	26.5	52.0	1.0	1.0	*	1.5	1.0	14.0	3.0
Berber and Atbara . .	62.9	14.5	2.3	0.3	0.3	0.2	2.6	14.3	2.6
<b>Mid-Sudan, 10°-16° N. :</b>									
Khartoum . . .	48.4	35.8	1.6	0.3	0.3	0.2	0.4	6.8	6.2
Wad Medani . . .	49.5	19.2	6.0	0.4	0.7	0.8	9.9	12.9	0.7
Dueim . . .	68.8	8.5	0.6	1.0	0.4	0.6	2.2	16.7	1.2
Roseires . . .	53.9	3.2	1.0	0.5	7.0	3.8	7.9	16.8	5.9
<b>South Sudan, 3°-10° N. :</b>									
Kodok . . .	55.4	10.9	3.6	3.5	6.0	4.7	3.5	3.1	9.3
Doleib Hilla . . .	40.0	24.5	1.0	5.8	11.3	6.8	1.6	2.6	6.5
Gambeila . . .	0.0	6.4	9.3	32.6	6.4	12.1	10.5	1.6	21.0
Mongalla . . .	14.5	8.5	15.9	3.8	12.9	2.0	7.0	4.8	30.6
Nimule . . .	11.0	17.0	64.0	0.0	7.0	0.0	1.0	0.0	0.0
<b>Red Sea, 19°-21° N. :</b>									
Dongonab . . .	40.1	24.0	2.6	5.4	2.9	0.0	1.4	14.4	9.2
Port Sudan . . .	20.0	64.3	2.7	2.3	0.7	0.7	1.4	6.7	1.2
Suakin . . .	34.8	21.4	6.6	1.1	1.7	0.7	4.5	27.0	2.1
<b>East Sudan, 12°-16° N. :</b>									
Kassala . . .	44.8	19.0	6.7	4.2	8.2	2.0	2.3	7.7	5.1
Gallabat . . .	11.9	2.1	14.5	5.2	18.5	5.0	6.7	21.8	14.3
<b>West Sudan, 7°-13° N. :</b>									
El-Obeid . . .	59.0	25.3	6.9	0.0	0.6	0.9	2.4	4.7	0.2
Kadugli . . .	10.2	42.4	26.3	6.4	6.4	1.1	4.8	2.4	0.0
Kafia Kingi (8 a.m., 2 years) . . .	3.2	27.5	3.2	26.0	6.4	8.0	16.1	9.6	0.0
Wau . . .	25.4	20.7	0.8	9.0	6.7	19.0	1.8	13.5	3.1

## APRIL

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
<b>North Sudan, 16°-22° N. :</b>									
Wadi Halfa . . .	44.0	30.9	2.7	1.2	3.6	1.4	3.5	5.6	6.9
Merowe . . .	30.0	43.5	3.0	1.5	1.0	1.0	1.0	15.0	4.0
Berber and Atbara . .	56.8	14.8	8.3	0.6	0.7	0.3	1.4	11.1	6.0
<b>Mid-Sudan, 10°-16° N. :</b>									
Khartoum . . .	37.0	33.1	5.2	2.1	1.9	0.6	1.1	9.5	9.5
Wad Medani . . .	45.0	19.1	7.0	1.6	4.7	2.8	8.6	9.4	1.8
Dueim . . .	51.1	13.7	2.1	2.4	5.2	5.5	1.6	12.7	5.7
Roseires . . .	27.0	2.6	1.5	1.7	26.8	8.2	7.4	18.7	6.1
<b>South Sudan, 3°-10° N. :</b>									
Kodok . . .	19.0	4.6	8.5	5.7	30.0	14.0	6.5	2.2	9.5
Doleib Hilla . . .	12.6	14.6	2.1	12.1	21.3	10.0	4.6	5.0	17.6
Gambeila . . .	0.0	1.7	5.0	21.3	5.4	21.7	15.8	6.0	23.3
Mongalla . . .	5.8	4.5	13.4	6.6	20.0	4.7	7.2	3.6	34.2
Nimule . . .	3.0	3.0	77.0	4.0	10.0	0.0	2.3	0.7	0.0
<b>Red Sea, 19°-21° N. :</b>									
Dongonab . . .	34.1	22.0	6.0	13.1	4.5	0.0	0.7	7.3	12.4
Port Sudan . . .	17.4	57.4	9.8	4.7	1.0	0.6	0.8	4.0	4.3
Suakin . . .	30.6	29.9	8.3	1.1	1.6	0.9	4.4	19.3	3.9
<b>East Sudan, 12°-16° N. :</b>									
Kassala . . .	31.3	17.4	8.3	7.7	15.9	4.0	2.5	6.5	6.6
Gallabat . . .	18.8	5.1	12.9	5.4	9.7	9.5	13.1	16.0	9.5
<b>West Sudan, 7°-13° N. :</b>									
El-Obeid . . .	44.1	26.0	7.7	0.8	1.8	4.3	6.9	8.1	0.3
Kadugli . . .	1.7	9.4	29.4	18.3	20.0	3.3	13.3	4.6	0.0
Kafia Kingi (8 a.m., 2 years) . . .	0.0	25.0	5.0	6.6	11.6	22.2	1.7	27.9	0.0
Wau . . .	12.4	14.6	3.5	9.5	22.2	27.3	4.6	5.3	0.6

TABLE XXIV (*continued*)

## WINDS. PERCENTAGE AND DIRECTION

\* = less than 0.1 per cent.

	MAY								
	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
<b>North Sudan, 16°-22° N. :</b>									
Wadi Halfa . . .	47.1	27.0	3.8	1.5	2.7	0.7	2.2	3.9	11.0
Merowe . . .	30.5	34.0	2.5	3.0	3.5	4.0	3.5	13.5	5.0
Berber and Atbara . .	45.5	20.7	9.7	3.0	5.9	2.2	5.1	4.1	3.8
<b>Mid-Sudan, 10°-16° N. :</b>									
Khartoum . . .	20.2	19.6	6.4	6.5	11.5	8.2	3.7	11.8	12.1
Wad Medani . . .	22.9	10.0	8.5	4.2	21.4	12.6	11.2	7.6	1.5
Dueim . . .	24.3	4.9	2.8	10.6	19.6	15.6	5.3	9.3	7.5
Roseires . . .	5.5	0.4	2.8	2.9	54.3	14.1	9.3	4.7	6.0
<b>South Sudan, 3°-10° N. :</b>									
Kodok . . .	4.2	2.9	8.4	4.9	46.4	20.0	4.6	2.3	6.3
Doleib Hilla . . .	2.2	2.2	10.8	11.1	42.4	12.2	4.0	2.2	12.9
Gambeila . . .	0.8	5.6	16.1	29.4	6.9	4.8	13.7	7.2	15.3
Mongalla . . .	8.8	4.5	15.2	6.6	22.1	3.3	7.9	1.5	30.1
Nimule . . .	9.0	2.0	86.8	0.0	2.0	0.0	0.2	0.0	0.0
<b>Red Sea, 19°-21° N. :</b>									
Dongonab . . .	35.8	21.2	8.1	10.7	2.4	0.8	0.5	8.5	12.0
Port Sudan . . .	13.2	49.9	8.8	12.4	1.7	0.7	0.7	6.4	6.2
Suakin . . .	28.0	33.4	8.6	3.7	0.5	0.2	5.3	14.3	5.9
<b>East Sudan, 12°-16° N. :</b>									
Kassala . . .	14.2	6.8	6.6	7.3	49.2	6.8	4.8	3.1	1.2
Gallabat . . .	14.3	5.7	14.9	8.2	8.1	16.6	20.6	5.7	5.9
<b>West Sudan, 7°-13° N. :</b>									
El-Obeid . . .	28.3	12.8	5.6	2.0	11.3	13.0	17.0	9.5	0.5
Kadugli . . .	3.8	5.4	25.8	21.5	22.5	7.0	7.0	7.0	0.0
Kafia Kingi (8 a.m., 2 years) . . .	3.2	3.2	6.4	9.7	3.2	42.2	24.1	8.0	0.0
Wau . . .	4.3	3.7	5.5	12.5	27.5	33.1	1.6	11.8	0.0

## JUNE

	N.	NE.	E.	SE.	S.	SW	W.	NW.	C.
<b>North Sudan, 16°-22° N. :</b>									
Wadi Halfa . . .	47.9	24.0	4.2	1.4	2.4	0.8	1.7	8.6	9.0
Merowe . . .	21.5	26.0	4.0	5.0	4.0	6.0	8.5	19.5	5.5
Berber and Atbara . .	31.7	6.7	5.8	2.8	9.5	10.6	14.9	5.8	12.2
<b>Mid-Sudan, 10°-16° N. :</b>									
Khartoum . . .	5.6	6.7	3.6	5.5	22.3	25.1	9.5	6.8	14.9
Wad Medani . . .	6.7	1.8	7.7	5.0	29.4	33.9	11.4	3.4	0.8
Dueim . . .	1.4	1.3	2.8	10.9	43.9	24.1	4.7	5.4	5.3
Roseires . . .	0.2	1.3	2.2	4.9	57.2	26.2	5.2	1.0	1.8
<b>South Sudan, 3°-10° N. :</b>									
Kodok . . .	7.0	1.3	6.4	7.3	47.4	17.3	6.5	0.9	5.9
Doleib Hilla . . .	4.2	3.1	10.4	14.6	38.8	10.4	4.2	1.9	12.3
Gambeila . . .	2.5	7.5	6.6	30.4	3.7	10.0	6.6	1.7	30.8
Mongalla . . .	7.6	2.3	14.2	9.1	26.1	3.2	8.1	3.2	26.2
Nimule . . .	12.5	7.0	79.9	0.0	0.4	0.0	0.2	0.0	0.0
<b>Red Sea, 19°-21° N. :</b>									
Dongonab . . .	41.3	30.6	3.4	1.7	0.6	0.0	0.2	9.5	12.7
Port Sudan . . .	16.8	45.4	10.2	9.1	1.5	1.4	2.6	8.8	4.2
Suakin . . .	22.8	30.7	8.3	2.6	2.2	2.9	12.4	15.0	3.2
<b>East Sudan, 12°-16° N. :</b>									
Kassala . . .	2.9	1.2	1.7	3.6	70.4	11.8	4.6	2.4	1.3
Gallabat . . .	9.6	3.1	17.3	9.6	9.6	18.2	24.9	5.0	2.7
<b>West Sudan, 7°-13° N. :</b>									
El-Obeid . . .	9.1	3.6	1.6	0.8	26.3	25.6	27.4	5.0	0.6
Kadugli . . .	0.6	3.3	21.1	17.7	35.5	4.4	15.7	1.7	0.0
Kafia Kingi (8 a.m., 4 years) . . .	3.8	0.9	8.5	2.8	10.3	65.4	4.7	1.8	1.8
Wau . . .	5.8	3.3	2.0	13.6	26.2	30.5	3.2	13.6	1.8

TABLE XXIV (*continued*)

## WINDS. PERCENTAGE AND DIRECTION

\* = less than 0.1 per cent.

## JULY

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
<b>North Sudan, 16°-22° N. :</b>									
Wadi Halfa . . .	41.0	21.9	3.3	0.8	2.7	1.8	3.8	11.3	13.3
Merowe . . .	15.0	13.0	2.5	9.0	7.5	18.0	11.0	16.5	7.5
Berber and Atbara . .	20.2	2.3	1.8	1.7	17.2	23.8	21.7	5.2	6.1
<b>Mid-Sudan, 10°-16° N. :</b>									
Khartoum . . .	2.3	2.0	1.1	4.1	34.0	42.1	6.7	2.4	5.3
Wad Medani . . .	8.1	1.7	6.2	5.2	35.2	28.8	13.4	1.0	0.4
Dueim . . .	1.0	0.4	2.1	16.4	44.2	24.5	4.8	2.1	4.5
Roseires . . .	1.5	0.0	3.0	5.3	59.4	17.2	7.6	3.8	2.2
<b>South Sudan, 3°-10° N. :</b>									
Kodok . . .	5.2	1.9	5.9	12.5	39.8	15.1	7.4	1.3	10.9
Doleib Hilla . . .	0.7	4.7	14.2	13.8	32.0	11.3	5.5	1.8	16.0
Gambeila . . .	2.2	7.2	13.7	25.8	11.3	7.2	10.5	3.2	18.5
Mongalla . . .	8.7	4.2	12.3	9.6	22.0	4.4	6.0	3.1	29.7
Nimule . . .	3.0	2.0	94.6	0.0	0.0	0.0	0.2	0.2	0.0
<b>Red Sea, 19°-21° N. :</b>									
Dongonab . . .	23.6	31.8	9.1	4.4	1.9	3.4	3.0	4.6	18.1
Port Sudan . . .	12.8	28.0	12.3	15.1	4.6	5.6	6.5	12.2	2.9
Suakin . . .	12.6	19.5	9.7	3.7	4.3	19.0	17.9	11.6	1.7
<b>East Sudan, 12°-16° N. :</b>									
Kassala . . .	0.0	0.5	1.6	5.4	68.3	19.2	2.3	0.3	2.4
Gallabat . . .	6.5	2.8	12.7	9.3	13.9	22.0	28.0	1.1	3.7
<b>West Sudan, 7°-13° N. :</b>									
El-Obeid . . .	2.0	1.3	3.1	1.7	31.1	32.8	23.8	3.1	1.1
Kadugli . . .	2.1	1.6	15.6	36.5	29.0	2.7	6.4	6.1	0.0
Kafia Kingi (8 a.m., 4 years) . . .	4.0	0.0	2.4	0.8	11.3	64.6	11.3	4.8	0.8
Wau . . .	2.2	1.8	3.0	10.5	21.1	32.2	7.2	16.0	6.0

## AUGUST

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
<b>North Sudan, 16°-22° N. :</b>									
Wadi Halfa . . .	43·5	22·0	4·3	0·3	2·3	0·4	3·4	9·4	14·4
Merowe . . .	16·5	14·0	1·5	6·0	10·5	21·0	8·0	20·0	2·5
Berber and Atbara . .	19·0	2·4	2·0	2·7	18·0	23·7	20·5	5·5	6·2
<b>Mid-Sudan, 10°-16° N. :</b>									
Khartoum . . .	1·5	1·1	0·7	3·6	30·9	43·6	7·6	1·7	9·3
Wad Medani . . .	8·3	0·7	7·2	5·1	38·8	24·0	14·0	1·9	0·0
Dueim . . .	1·7	1·2	1·4	14·8	46·0	23·3	5·0	1·0	5·7
Roseires . . .	3·0	2·1	3·9	3·8	54·0	21·4	7·8	3·0	0·4
<b>South Sudan, 3°-10° N. :</b>									
Kodok . . .	4·2	4·0	7·7	8·5	38·5	14·6	6·6	2·6	13·3
Doleib Hilla . . .	2·9	5·6	10·3	14·4	34·5	9·9	5·9	2·2	14·4
Gambeila . . .	1·6	8·0	4·8	21·0	6·4	11·3	9·0	9·0	29·0
Mongalla . . .	11·3	4·7	12·9	7·9	19·9	4·1	7·5	3·9	27·8
Nimule . . .	7·0	5·0	83·6	0·2	2·0	0·8	1·2	0·2	0·0
<b>Red Sea, 19°-21° N. :</b>									
Dongonab . . .	22·2	26·6	9·4	3·7	2·8	2·5	2·8	9·5	20·4
Port Sudan . . .	15·7	20·1	14·0	15·2	4·0	7·7	5·0	13·9	4·4
Suakin . . .	12·7	18·4	10·0	3·5	6·2	20·2	15·7	10·7	2·7
<b>East Sudan, 12°-16° N. :</b>									
Kassala . . .	0·1	0·3	0·6	6·4	72·5	17·3	1·0	1·7	0·0
Gallabat . . .	10·7	1·2	6·8	11·6	13·8	18·9	23·4	3·4	10·0
<b>West Sudan, 7°-13° N. :</b>									
El-Obeid . . .	1·7	1·3	2·9	1·5	26·5	34·9	28·0	2·2	1·0
Kadugli . . .	3·2	2·1	31·7	25·8	29·0	1·6	2·7	3·9	0·0
Kafia Kingi (8 a.m., 4 years) . . .	0·8	1·6	2·4	0·0	17·8	57·3	9·6	8·1	2·4
Wau . . .	4·5	2·1	0·8	6·5	16·8	30·8	6·2	18·6	13·7

TABLE XXIV (*continued*)

## WINDS. PERCENTAGE AND DIRECTION

\* = less than 0.1 per cent.

SEPTEMBER										
	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.	
<b>North Sudan, 16°-22° N. :</b>										
Wadi Halfa . . .	54.1	23.4	4.6	0.5	0.8	0.4	2.2	9.6	4.3	
Merowe . . .	19.0	28.0	4.0	5.0	3.0	13.0	5.0	19.0	4.0	
Berber and Atbara . .	18.6	6.9	12.4	5.8	18.0	14.0	10.3	5.8	8.2	
<b>Mid-Sudan, 10°-16° N. :</b>										
Khartoum . . .	5.6	4.3	2.2	4.7	27.0	30.4	6.6	3.8	15.4	
Wad Medani . . .	13.2	1.3	10.4	9.2	34.5	17.0	12.3	1.8	0.3	
Dueim . . .	2.0	1.1	3.5	14.4	47.4	17.1	6.8	2.0	5.6	
Roseires . . .	5.8	3.1	7.6	6.1	51.2	14.5	7.4	1.9	2.5	
<b>South Sudan, 3°-10° N. :</b>										
Kodok . . .	9.7	7.3	7.1	11.6	27.4	14.0	5.0	4.2	13.7	
Doleib Hilla . . .	7.2	8.9	15.3	6.8	19.5	4.7	5.5	6.4	25.8	
Gambeila . . .	0.0	4.1	14.1	31.7	12.5	14.2	9.1	10.0	4.1	
Mongalla . . .	12.4	8.2	15.5	5.9	17.4	2.3	6.2	3.2	28.9	
Nimule . . .	4.0	1.7	88.6	0.0	3.4	0.0	1.7	0.2	0.4	
<b>Red Sea, 19°-21° N. :</b>										
Dongonab . . .	38.6	31.4	4.4	1.7	1.1	0.9	1.9	9.8	10.3	
Port Sudan . . .	18.2	39.6	12.7	9.1	1.6	2.2	2.0	10.8	3.8	
Suakin . . .	23.8	28.1	7.4	2.3	4.1	7.2	10.5	9.9	6.9	
<b>East Sudan, 12°-16° N. :</b>										
Kassala . . .	2.4	1.5	2.6	10.4	63.3	14.7	2.2	1.5	1.5	
Gallabat . . .	10.0	4.8	11.1	14.1	12.8	13.4	21.8	3.6	8.4	
<b>West Sudan, 7°-13° N. :</b>										
El-Obeid . . .	3.8	2.6	6.4	3.3	23.8	27.6	27.1	4.5	0.9	
Kadugli . . .	6.6	10.0	27.7	27.7	6.1	1.1	5.0	15.8	0.0	
Kafia Kingi (8 a.m., 4 years) . . .	9.2	6.6	0.0	3.3	13.3	47.5	10.0	7.5	1.6	
Wau . . .	7.6	5.7	0.7	13.8	14.4	28.3	8.2	11.0	12.3	

## OCTOBER

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
<b>North Sudan, 16°-22° N. :</b>									
Wadi Halfa . . .	<b>53.0</b>	26.1	5.6	1.1	1.4	*	2.5	8.2	2.1
Merowe . . .	19.5	<b>42.5</b>	4.0	1.0	3.0	4.0	3.0	21.0	2.0
Berber and Atbara . .	<b>31.9</b>	16.2	18.7	6.9	5.8	2.4	4.2	5.0	8.9
<b>Mid-Sudan, 10°-16° N. :</b>									
Khartoum . . .	<b>29.4</b>	21.8	3.4	3.2	9.9	7.3	4.6	6.0	14.4
Wad Medani . . .	18.5	7.8	14.1	6.2	<b>21.7</b>	11.9	14.2	4.7	0.7
Dueim . . .	<b>27.3</b>	7.7	4.4	8.6	18.1	9.0	8.3	8.8	7.8
Roseires . . .	4.9	1.5	7.9	8.0	<b>37.3</b>	19.3	9.4	5.4	6.2
<b>South Sudan, 3°-10° N. :</b>									
Kodok . . .	16.4	11.8	6.5	12.3	<b>20.6</b>	10.5	2.9	5.2	13.8
Doleib Hilla . . .	9.1	9.3	17.5	10.3	<b>18.1</b>	5.8	4.5	6.9	18.5
Gambeila . . .	1.6	4.8	10.5	<b>50.8</b>	13.7	6.4	4.8	4.8	2.2
Mongalla . . .	15.0	10.3	<b>17.8</b>	4.6	17.3	2.7	4.1	2.9	25.3
Nimule . . .	2.0	0.2	<b>86.4</b>	0.2	4.0	0.0	6.4	0.6	0.2
<b>Red Sea, 19°-21° N. :</b>									
Dongonab . . .	<b>36.3</b>	24.4	6.8	5.4	2.6	0.2	1.1	10.9	12.3
Port Sudan . . .	21.5	<b>45.6</b>	11.1	6.1	0.6	1.5	2.2	8.1	3.3
Suakin . . .	28.8	<b>35.2</b>	8.5	1.8	0.7	1.8	5.8	11.2	6.1
<b>East Sudan, 12°-16° N. :</b>									
Kassala . . .	14.2	9.7	10.3	14.0	<b>39.8</b>	4.1	1.8	4.3	2.0
Gallabat . . .	10.2	3.5	9.6	6.6	14.9	9.8	<b>24.9</b>	6.2	14.4
<b>West Sudan, 7°-13° N. :</b>									
El-Obeid . . .	<b>37.3</b>	10.8	8.6	2.2	7.5	11.1	13.8	8.2	0.5
Kadugli . . .	14.5	12.9	24.7	16.1	0.6	1.6	4.3	<b>25.3</b>	0.0
Kafia Kingi (8 a.m., 3 years) . . .	5.5	12.2	13.3	4.4	16.6	13.3	3.3	<b>31.4</b>	0.0
Wau . . .	7.1	10.5	2.9	14.3	10.4	<b>28.3</b>	5.8	14.0	6.7



TABLE XXIV (*continued*)

## WINDS. PERCENTAGE AND DIRECTION

\* = less than 0.1 per cent.

## NOVEMBER

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
<b>North Sudan, 16°-22° N. :</b>									
Wadi Halfa . . .	51.3	31.4	2.4	*	0.7	0.0	1.8	4.7	7.6
Merowe . . .	20.5	47.5	1.5	0.5	0.5	1.5	0.5	25.5	2.0
Berber and Atbara .	51.0	22.2	7.6	0.7	0.0	0.5	6.0	10.1	1.9
<b>Mid-Sudan, 10°-16° N. :</b>									
Khartoum . . .	57.2	28.5	1.3	0.2	0.2	0.1	0.4	5.6	6.5
Wad Medani . . .	41.0	23.3	6.0	1.0	3.2	1.1	11.9	12.4	0.0
Dueim . . .	65.2	9.8	1.3	0.8	0.6	*	0.2	17.6	4.6
Roseires . . .	17.8	12.9	16.0	1.4	17.6	4.7	9.7	12.2	7.7
<b>South Sudan, 3°-10° N. :</b>									
Kodok . . .	36.5	17.5	4.8	3.2	9.4	3.2	1.4	3.6	20.4
Doleib Hilla . . .	38.4	13.9	7.2	11.4	6.8	2.1	2.5	3.4	14.3
Gambeila . . .	3.3	7.5	9.1	37.5	7.5	14.1	10.8	8.3	1.7
Mongalla . . .	14.7	10.1	24.9	4.9	11.5	1.2	4.8	1.3	26.6
Nimule . . .	1.5	1.9	85.0	0.4	2.5	0.0	8.0	0.6	0.2
<b>Red Sea, 19°-21° N. :</b>									
Dongonab . . .	34.4	20.6	4.6	7.4	4.3	1.5	0.2	18.7	8.3
Port Sudan . . .	23.0	56.4	9.2	3.3	0.2	0.2	1.7	4.6	1.4
Suakin . . .	27.6	31.3	9.6	1.0	1.0	1.2	11.6	15.0	1.8
<b>East Sudan, 12°-16° N. :</b>									
Kassala . . .	33.2	21.5	11.5	9.4	8.4	2.6	1.4	5.3	6.6
Gallabat . . .	9.9	3.0	13.3	6.1	17.8	6.7	18.5	5.4	19.4
<b>West Sudan, 7°-13° N. :</b>									
El-Obeid . . .	63.3	22.1	5.9	0.2	0.9	0.2	1.0	6.2	0.2
Kadugli . . .	6.1	22.2	33.3	15.0	1.1	1.1	0.0	21.2	0.0
Katia Kingi (8 a.m., 4 years) . . .	38.4	7.5	11.7	20.0	3.3	5.0	2.5	11.6	0.0
Wau . . .	22.5	19.9	7.2	12.1	3.7	11.7	2.7	12.8	7.4

## DECEMBER

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
<b>North Sudan, 16°-22° N. :</b>									
Wadi Halfa . . .	49.4	27.8	5.4	0.5	0.4	0.1	2.4	3.8	10.2
Merowe . . .	30.0	40.0	3.0	*	0.0	1.0	*	2.0	3.0
Berber and Atbara . .	68.9	16.9	1.3	0.1	0.3	0.0	2.6	9.4	0.5
<b>Mid-Sudan, 10°-16° N. :</b>									
Khartoum . . .	65.7	27.7	0.5	*	0.1	0.0	0.1	3.1	2.8
Wad Medani . . .	47.9	30.6	4.3	0.0	0.0	0.0	9.1	7.8	0.3
Dueim . . .	71.7	7.6	0.1	0.0	0.0	0.0	0.0	19.5	1.0
Roseires . . .	56.1	8.9	2.8	0.0	1.0	1.4	9.5	20.3	0.0
<b>South Sudan, 3°-10° N. :</b>									
Kodok . . .	62.6	22.4	1.0	0.4	0.4	0.6	1.0	2.3	9.3
Doleib Hilla . . .	72.5	15.4	0.0	3.2	0.0	0.8	0.0	4.0	4.0
Gambeila . . .	0.8	5.6	5.6	42.7	6.4	12.9	9.7	9.0	7.2
Mongalla . . .	31.4	11.8	13.8	2.9	7.9	0.9	7.1	3.3	20.9
Nimule . . .	0.6	0.4	94.0	0.0	2.0	0.0	3.0	0.0	0.0
<b>Red Sea, 19°-21° N. :</b>									
Dongonab . . .	31.5	23.1	2.0	3.3	2.5	0.3	1.0	30.9	5.4
Port Sudan . . .	22.2	59.3	1.4	5.3	0.0	0.0	1.0	9.7	1.1
Suakin . . .	36.4	21.8	6.2	0.4	0.1	0.7	14.0	19.5	0.9
<b>East Sudan, 12°-16° N. :</b>									
Kassala . . .	40.0	26.8	9.3	4.3	5.4	0.7	1.3	4.9	7.3
Gallabat . . .	13.4	5.7	11.0	10.8	16.0	6.6	7.3	10.4	18.7
<b>West Sudan, 7°-13° N. :</b>									
El-Obeid . . .	63.4	21.9	6.2	0.0	0.0	0.0	0.4	8.0	0.1
Kadugli . . .	8.6	44.0	23.1	6.0	6.0	0.5	3.2	8.6	0.0
Kafia Kingi (8 a.m., 3 years) . . .	10.8	10.8	9.7	38.4	10.8	1.1	16.2	2.2	0.0
Wau . . .	34.9	20.3	7.2	7.3	0.8	6.9	0.6	16.4	5.6

## GAZETTEER OF TOWNS

THE following are brief notes on some of the more important towns of the Sudan, beginning with Khartoum and Omdurman ; the others are arranged in alphabetical order. The population in several cases has not been ascertained ; where it is not stated, it may be assumed not to exceed 2,000–3,000. There is a Post and Telegraph Office at each town.

- For rail, steamer, and caravan connexions, see *Communications*.

**KHARTOUM** (lat.  $15^{\circ} 36'$  N., long.  $32^{\circ} 32'$  E.), alt. 1,255 ft. above Mediterranean ; 1,750 miles by river, 1,345 by rail, from Cairo ; 1,077 miles by river from Gondokoro. On the left bank of the Blue Nile, on a tongue of land formed by the junction of the Blue and White Niles just above Tuti Island. The name (=elephant's trunk) is suggested by this jutting-out land. On alluvial soil ; banks about 30 ft. above low water.

Telephone.

*Population* in 1917. According to the Sudan Almanac, 23,083 ; according to the Medical Report, 18,905 ; the latter admitted that the figures were probably underestimated.

*Description*.—Seat of Sudan Government, and of Khartoum Province ; Residence of Governor General and of Mudir ; head-quarters of all Administrative Departments, of the Army, and Law Courts. The town was practically destroyed by the Dervishes in 1886, but has been well laid out since 1898 on a plan drawn up by Lord Kitchener, and is now a fine city. A broad avenue, 3 miles long and about 100 ft. wide, planted with trees, forms the river front, its solid stone wall broken by landing-places. Several similar avenues, either parallel with the river (e. g. Khedive and Sirdar Avenues) or running at right angles to it (e. g. from west to east, the avenues named Kitchener, King's, Victoria, Mohammed Ali, Gordon), form

squares and boulevards. Many of them are planted with trees. The roads are metalled. In the centre is Abbas Square, with a new mosque, the largest in the Sudan.

There are beautiful gardens, and the private and public buildings, of mud-brick and stone, are of a handsome type. Regulations are in force for the erection of new buildings; as follows. Government allots portions of land to those desiring to build, on condition that a building of a specified kind shall be erected within a stated time. If the condition is not fulfilled, the land returns to Government. Buildings are of three classes: (1) the principal ones near the river, (2) those of a smaller kind, with two storeys, which may be built between Khedive and Sirdar Avenues, (3) those south of the latter, which are native houses.

*Buildings and Institutions:—On the river embankment.*—The Governor General's Palace, in a central position. (It occupies the site of Gordon's old palace; a tablet indicates the spot where he fell. Six acres of beautiful garden surround it.) To west of the Palace are some Government offices, e. g. the head-quarters of the Legal and Financial Secretaries, of the Controller of Stores, of the Directors of the Surveys, Works, and Intelligence Departments, Wild Animals' Preservation Department, and of the Senior Medical Officer. Also (from west to east) the Mogren Quays, Grand (or Victoria) Hotel, Coptic Church, P. and T. O., War Office, Sudan Club (at the corner of Mohammed Ali Avenue, with garden and tennis-courts), the Austrian R. C. Mission, Egyptian Army Hospital, Gordon College (see below), British barracks, ice factory, water and electric-light works.

*In Khedive Avenue* (from west to east).—The Khartoum Province and Municipality Mudiria Head-quarters, Irrigation Offices, Law Courts, National Bank of Egypt, Masonic temple, All Saints' Cathedral (foundation stone laid in 1904, consecrated in 1912), Maronite Church, Junior Sudan Club, Anglo-Egyptian Bank, Veterinary Department, Military School, Primary School, Ordnance Department of the Egyptian Army.

*In Sirdar Avenue.*—Central station of municipal steam tramways, Bank of Athens.

*At the southern end of Victoria Avenue.*—Civil hospital, Railway station, cemetery.

There are various markets round Abbas Square on the north-east. The commercial quarter, largely inhabited by Greeks, is south of Khedive Avenue, near the National Bank of Egypt and the Mudiria.

Behind the Palace are the Public Gardens, with a statue of Gordon riding a camel. Adjoining the Grand Hotel on the embankment are the Zoological Gardens. To south of the town, beyond the railway, are the race-course, golf course, Egyptian Army barracks, and native villages, each tribe having its own settlement under the Government Townlands (Native Lodging Area) scheme. A line of old fortifications extends south of the town from the Blue to the White Nile.

*Hotels.*—Grand (see above), with Cook's office during the winter season, Royal (in centre of town), Gordon, New Khedivial (with Restaurant d'Athènes).

*Churches.*—All Saints' Cathedral, Greek, Roman Catholic, Maronite.

*Schools.*—Government Schools; C.M.S. and American Mission Schools.

*Supreme Court of Appeal*, under Moslem Grand Kadi.

*Labour bureau.*

*Newspapers.*—The *Sudan Gazette* (an official publication, containing Government notices and ordinances; to be obtained of the Civil Secretary); *Sudan Times* (published on Monday and Thursday, in English and Arabic); *Sudan Herald* (published on Saturday, in English, Arabic, and Greek).

*Gordon Memorial College.*—This is opposite the Blue Nile bridge, and was built by subscriptions raised by Lord Kitchener. It was completed in 1902, and has been extended since. It includes a primary school; a department of manual training and technical instruction (engineering, surveying, &c.);

a training college (vernacular and English); military school, economic museum (for assisting the commercial development of the Sudan), and an archaeological collection. The military school has proved very popular with the natives. A highly important department consists of the Wellcome Laboratories for analytical and bacteriological research; it investigates and reports on subjects of vital importance, such as diseases of men and beasts, ethnography, means of combating locusts, mosquitoes, tsetse and serut fly, improvement of gum forests, composition of soils, and wells. There is a climatological station for Nile and rainfall measurements.

*Trade.*—Khartoum is well adapted by its position to be a commercial centre. It is full of Greek, Syrian, and Coptic traders. There are no considerable local manufactures.

*Health.*—An ideal winter resort (mid-October to early April). Even the hottest months (April, May, June) are bearable, as the atmosphere is very dry, and the nights are cool. The sandstorms in May and June are the most trying feature. Mosquitoes have been largely suppressed, and sanitary conditions greatly improved; the town may now be considered remarkably healthy. (For fuller details, see *Health Conditions*.) The water-supply is excellent. It is obtained from wells 328 ft. deep, the upper strata being cut off laterally by a cement casing to a depth of 180 ft. The water is raised by two deep-well centrifugal pumps and three compressed air-lift wells. It is then delivered into a low-level reservoir of 4,800 cubic metres capacity, then pumped into a service tank of 750 cubic metres capacity, and finally distributed to the town through underground wrought-iron and cast-iron pipes.

*Inhabitants.*—Representatives of the whole Sudan, with Egyptians, Greeks, and Syrians.

A native police force was organized in 1914.

*History.*—First known as a military station under Mohammed Ali about 1830. Travellers between 1860 and 1880 describe its then unhealthy conditions. It was besieged by the Mahdi from April 1884 to January 26, 1885 and re-entered

by the victorious British and Egyptian troops on September 4, 1898.

**KHARTOUM NORTH** (formerly called Halfaya). On the right bank of the Blue Nile, opposite Khartoum, joined to it by a bridge, and connected by a steam-ferry.

*Population* in 1917. According to the Sudan Almanac, 15,973 ; according to the Medical Report, 14,018.

*Buildings*.—Railway stores and workshops ; head-quarters and dockyard of Steamers and Boats Department. Customs, barracks, prison, isolation compound for infectious diseases.

Native markets.

At Shambat, opposite Omdurman, is a central research farm, including a small ostrich farm.

**OMDURMAN** (lat. 15° 38' N., long. 32° 29' E.). Three miles north by west of Khartoum, to which it is joined by a steam-ferry. On the west bank of the Nile, immediately north of the junction of the Blue Nile with the White.

Telephone.

*Population* in 1917.—59,429.

*Description*.—Native capital and trade centre ; focus of native life ; centre of native Intelligence system ; clearing-house and exchange for whole Sudan ; halting-place for pilgrims between West Africa and Mecca.

The town straggles along the river for nearly six miles, its oldest and most southern part is nearly opposite Khartoum. It is nowhere more than three miles wide. Dense masses of mud-brick houses are threaded by a network of narrow lanes ; two or three wide streets run from end to end. For the important and picturesque native markets and bazaars, see below.

*Buildings and Institutions*.—(a) *Native*. The chief native buildings face a central square ; wealthy natives from the whole Sudan have town houses at Omdurman. The buildings of historic interest are as follows : ruins of the Mahdī's Tomb (*Kubbat el-Mahdi*) ; house of the Khalifa ; house of Yakub (his son) ; *Beit el-amana* (i. e. treasury). The house of the Khalifa is now the residence of the Sub-Governor of the

Province. The *Beit-el-amana* is on the north side of the town, close to the river. It was the Dervish storehouse and powder-magazine, and now contains Gordon and Dervish relics. The present mosque, adjoining the Khalifa's house, replaces an old one ; it is of burnt brick whitewashed.

(b) *European*. Civil Hospital and Military Hospital ; C.M.S. Hospital (opened in 1914) ; Government elementary and technical schools (stone-cutting, pottery, and brick-work taught) ; C.M.S. and American Mission Schools ; police-station, prison, Jewish Synagogue.

*Outside the town*.—Barracks (to north and south) ; leper isolation station, polo-ground and golf-course.

*Markets and Bazaars*.—These are one of the chief features of interest in Omdurman, and of great economic importance. The three chief markets are on the steam-tram route, two of them near the ferries. Some extensive new markets were erected by Government about 1912, but the old ones are more popular among the natives. Strict regulations as to the cleanliness of the markets, the condition of the food-stuffs, and honesty in weights and measures, are enforced as far as possible. Sudan products are exchanged for European goods. Native work in leather and metal is on sale ; the silversmiths have a street to themselves. The trade in gum, grain, and cattle is very important ; Kordofan and other gum is sorted by women on the river banks. The fruit bazaar is especially picturesque.

*Health*.—The town is situated on good gravel soil, but the sanitation is bad. House-to-house inspection will have to be undertaken, when the needed sanitary staff is available, but with caution, to avoid arousing native opposition. More space is required in crowded areas, and a better water-supply. Steps have recently been taken to protect the main well, but this and the others in use are shallow ; water is also drawn direct from the river. In spite of these drawbacks, the population appears healthy, but an epidemic would give cause for alarm. For further details, see *Health Conditions*.

*Inhabitants*.—The population is even more varied than in



Khartoum, all the principal tribes and families of the Sudan having agents or representatives in Omdurman. In 1913, there were nearly 53,000 natives, over 900 Europeans, over 900 Egyptians, Abyssinians and Indians, and about 2,300 soldiers (British or Egyptian).

*History.*—The town was of no importance till after the fall of Khartoum (1885); it then became the head-quarters of the Mahdi and Khalifa till 1898; it was bombarded on September 2, 1898, when the Battle of Omdurman was fought 7 miles to north, at Kerreri, and recaptured after that victory.

**ATBARA.**—At the junction of the River Atbara with the Nile; 296 miles from Port Sudan. Population over 2,000, including military. Head-quarters of the Sudan Railways; site of their main workshops; fine iron bridge across the river just beyond the railway station; hospital. Battlefield (April 8, 1898) some miles away.

**BERBER** (lat.  $18^{\circ} 1' N.$ , long.  $33^{\circ} 59' E.$ ). On the east bank of the Nile; 224 miles by river from Khartoum, 362 miles by rail from Halfa, about 245 by road from Suakin. Alt. 1,140 ft. above Mediterranean.

*Description.*—Chief town of a district; Residence of two Inspectors and of the Mamur; former capital of Province. A long, straggling, mud-built town, with an old town adjoining a newer; two broad and straight main thoroughfares, with a number of narrow byways.

*Buildings and Institutions.*—Civil hospital; mosque (in process of reconstruction in 1913); upper grade primary school (140 pupils in 1913); market; climatological station.

*Health.*—Subject to fever, owing to mists from the river; sanitary conditions formerly unsatisfactory (1897); water-supply from river.

*History.*—Captured by Mahdists in May 1884; reoccupied in September 1897.

**DONGOLA** (lat.  $19^{\circ} 10' N.$ , long.  $30^{\circ} 29' E.$ ).—New Dongola, also called El-Ordi (the Barracks), is two miles to north of the pre-Mahdi town, and about 70 miles to north of Old Dongola,

now a heap of ruins. On the west bank of the Nile, 669 miles by river from Khartoum, 277 from Halfa.

Rest house.

*Description.*—Chief town of a district; Residence of Inspector and Mamur; former capital of Province. Clean, well-built houses of mud and stone; old fortifications surround the town.

*Buildings and Institutions.*—Civil hospital, mosque, shops, and flour mills.

*Trade and Agriculture.*—A thriving town, important agricultural and trading centre.

*Health.*—Good climate.

*History.*—Founded about 1812; in 1884–5 it was the base of the British troops advancing on Khartoum; reoccupied in September 1896.

**EL-DAMER.** On the right bank of the Nile, south of the Atbara confluence.

Capital of Berber Province, residence of Governor; dispensary; good market; the chief wares are *dom*-mats, baskets, salt, &c.

**EL-DUEIM** (lat. 13° 59' N., long. 32° 20' E.). On the west bank of the White Nile, 130 miles by river south of Khartoum.

*Population.*—Has been variously estimated at 5,000 and 7,000, but is probably less, in view of the migration of merchants and others to Kosti since the railway extension to El-Obeid.

*Description.*—Capital of White Nile Province; Residence of Governor; well laid-out streets; well-built official houses; natives well housed in mud dwellings.

*Buildings and Institutions.*—Civil hospital (completed in 1910); mosque; technical school and workshop (with 146 boys in 1913); prison (built in 1910); unpretending Greek café; climatological station, with Nilometer; river level recorded daily. Foreign and native merchants' stores have been lately reduced in number (see above).

*Trade.*—Before the advent of the railway to Kosti, El-Dueim was an important market, 90 per cent. of the gum

export from Kordofan passing through it. Some iron-smelting is carried on.

*Health.*—Site fairly healthy, in an open plain.

*Inhabitants.*—Mostly Danagla and Hassaniya Arabs.

*History.*—Egyptian garrison repulsed Mahdists here in September 1883.

**EL-FASHER** (lat.  $13^{\circ} 37' N.$ , long.  $25^{\circ} 23' E.$ ). Alt. 2,418 ft. above sea-level; 446 miles by road from El-Obeid, 300 miles nearly due east of Abesher (Wadai). Wireless communication with Kebkebia in 1917; its intended removal to Zalingei reported, but in 1918 that post considered too swampy, and Kereinik appeared likely to be finally chosen.

*Population.*—1,500–2,000 (as reported by Tilho in 1917).

*Description.*—Capital of Darfur Province; Residence of Governor (since 1917); built upon sandy dunes surrounding a depression, the Wadi Tendelti, flooded during the rainy season by the Khor El-Ko. In 1905 it consisted almost entirely of straw huts and sheds, with a few mud houses; in 1917, it was described by Tilho as the finest native town in Central Africa.

*Buildings.*—Fort, opposite the fine palace of the late Sultan; this latter is constructed almost entirely of local materials, with a thatched roof and ebony trellis-work inside; it includes gardens, arcades, and store-rooms. The Sultan had other splendid residences in the town.

*Trade.*—Market; lead-mines reported to west of town.

*Health.*—Climate healthy and agreeable even during the hottest season.

*Water-supply.*—Sufficient for the population; obtained from the reservoir or lake formed by the Tendelti; every year a barrage is constructed across the Ko and the water thus held up is turned aside to fill the lake; the actual water lasts for seven months of the year; during the others, several hundreds of wells are dug in the bottom.

*History.*—Darfur was a tributary State under a native Sultan until 1916, when an expedition was sent against the then Sultan, Ali Dinar, in consequence of his alliance with

Turks and Senussis. He fled from El-Fasher on May 24 and was subsequently killed in action.

**EL-OBEID** (lat. 13° 11' N., long. 30° 13' E.). Alt. between 1,700 and 2,000 ft.; 155 miles from El-Dueim, 446 from El-Fasher.

Telephone.

*Population.*—Mixed and fluctuating; the normal population is about 12,000, but has reached 40,000; about 100 foreign merchants, mostly Syrian.

*Description.*—Situated on the side of a depression, with a khor running through it; capital of Kordofan Province; Residence of Governor, Inspector, a Mamur, and two sub-Mamurs. The town is laid out with straight, wide streets. It and the market contain numerous buildings of mud brick; most of the natives live in grass huts. To south of the town, and separated from it by an open space some 800 yds. wide, are the Government buildings, including barracks (for one infantry battalion, camel corps, artillery), stores, and magazine. Opposite these are the officers' houses, enclosed in a compound, with a wall for purposes of defence, and a tower, 30 ft. high, built by Ismail Pasha. The tower is of English brick, covered with plaster, and is pitted by Mahdist bullets. To south of the compound is a great reservoir (*fula*), 150 yds. by 90 yds., which serves as a watering-place during the rains.

*Buildings.*—Barracks, &c., as above; mosque in process of construction (1913); Government school; civil hospital (described in 1913 as insufficient for local needs); climatological station. The tomb of Sayed el-Mekki is a well-known landmark.

*Trade.*—Much-frequented grain and cattle market; flourishing gum trade. The National Bank of Egypt has a branch here.

*Water-supply.*—Sometimes runs short in very dry seasons; obtained from wells, some of which are 60 to 80 ft. deep, and situated in the bed of the khor already mentioned.

*History.*—El-Obeid suffered a six months' siege by the Mahdi in 1883-4, after which it was forced to surrender. Hicks and his Egyptian force advancing to relieve it were

annihilated at Aloba, about 30 miles to south of the town. The Mahdi's troops held it till the end of December 1889, when it was found by the English ruined and deserted.

In April 1918 there was a serious fire in the main street of El-Obeid, twelve shops and their contents being completely destroyed.

**GALLABAT** (called by the Abyssinians Matamma). On the left bank of the Khor Abnaheir, about five miles from the River Atbara.

Telegraph terminus. Rest house.

*Description.*—Chief town of a district ; Residence of Inspector and Mamur. Town lies at the foot of a steep slope. Principal station on frontier with Abyssinia ; consists of two main streets of *tukls* (huts) ; barracks, R. H. and P. T. O. are in the enclosure of an old fort, on the top of the hill. There is a garrison, also a civil police force.

*Trade.*—Considerable trade is done by Abyssinians in coffee, cotton being chiefly bought in exchange ; the town imports livestock and exports raw cotton ; half the customs revenue goes to Abyssinia.

*Health.*—Healthy between December and June, but the reverse for the rest of the year. The *scrut-fly* is a pest.

*Water-supply.*—Chiefly from the Khor Abnaheir, which becomes stagnant towards the end of the dry season. There are small springs near the fort.

*Inhabitants.*—Mostly Takruris, who came originally from Darfur.

**GEDAREF** (lat. 14° 2' N., long. 35° 24' E.). By road, 137 miles from Wad Medani, 94 from Gallabat.

*Description.* Chief town of a district ; Residence of Mamur. Town lies partly on an underfeature of low hills (100 ft.) half a mile to east of it, partly on a plain ; it consists of a number of scattered villages, the chief of which is called Hellet el-Suk (market). Some consist of houses of sun-dried brick with flat roofs, others of conical thatched huts, the latter cover about 5 miles ; surrounded by gardens and cultivations of *dura*, cotton, &c.

*Buildings.*—Barracks of garrison ; prison ; school (with 112 pupils in 1913) ; new civil hospital (1914).

*Trade.*—Daily market, numerous shops kept by Greeks, who sell cheap European goods (mirrors, silk, sugar, soap) and barrels of olives ; some gum trade.

*Health.*—Healthy from December to May ; malaria prevalent in rainy season (September and October) ; *serut-fly* then troublesome ; camels removed for safety about end of May.

*Water-supply.*—From wells ; good, but not plentiful.

*History.*—The old town was called Suk Abu Sin ; before the *Mahdiya*, the surrounding corn-fields supplied a great part of the Sudan ; town devastated by Dervishes in 1885 and garrison captured ; won back in 1898.

**KASSALA** (lat. 15° 28' N., long. 36° 24' E.). Alt. above sea-level 1,700 ft. On the River Gash, 15 miles west of the Eritrean frontier.

*Population.*—Stated by one authority to be 12,000 in 1907, by another, 20,000 in 1917. These figures probably exaggerated.

*Description.*—Capital of Kassala Province ; Residence of Governor ; important military station. Chief buildings of brick ; grass *tukls* ; picturesque aspect owing to gardens and near mountains.

*Buildings and Institutions.*—Fort, forming rectangle 210 yds. by 105 yds., with walls 11 ft. high, contains all Government offices ; mosque in the Hallenga quarter ; hospital ; school, and technical school ; prison ; Government experimental farm ; climatological station. Near the town is the tomb-mosque of Khatmiya, head-quarters of the loyal Mirghani family, founders of a widespread and influential religious confraternity. (See p. 256.)

*Trade.*—Local emporium ; caravan trade (gum, grain) with Suakin ; European goods (e. g. piece cotton) imported.

*Health.*—During the rains, and largely in consequence of the prevalent *serut-fly*, the Government is transferred to healthier quarters at Goz Regeb ; many of the wealthier

inhabitants also move thither. In 1913 it was reported that the drainage system was being improved.

*Inhabitants.*—Chiefly Hallenga Arabs, with some Takruris, originally from Darfur.

*History.*—Founded by Egyptians in 1840 ; was capital of Taka Province ; captured by Dervishes in 1885 ; retaken by Italians in 1894 and restored by them to Egypt in 1897.

**KOSTI** (lat.  $13^{\circ} 10' N.$ , long.  $32^{\circ} 40' E.$ ). On the west bank of the White Nile ; 237 miles by rail from Khartoum.

*Population* not ascertained, but increasing with the increasing importance of Kosti since the advent of the railway. A busy grain-market ; many traders. A few miles from the town is a bridge over the river, 500 yds. long.

**MEROWE** (lat.  $18^{\circ} 28' N.$ , long.  $31^{\circ} 49' E.$ ). On the left bank of the Nile, 448 miles by river from Halfa, 501 from Khartoum.

*Description.*—Capital of Dongola Province ; Residence of Governor ; town well laid out ; broad streets planted with trees ; houses of mud-brick, colour-washed. The Governor keeps up a fine tropical garden. There is a Nile gauge.

*Buildings.*—Civil hospital ; school ; Province prison.

On the opposite bank is an old village, Kareima, with the railway terminus.

**NAHUD** (lat.  $12^{\circ} 41' N.$ , long.  $28^{\circ} 26' E.$ ). 130 miles by road from El-Obeid.

*Population.*—Fluctuates, owing to influx of traders, between 7,000 and 12,000 (1912).

*Description.*—The only large town in western Kordofan ; head-quarters of a district ; Residence of Inspector, Mamur, and three sub-Mamurs ; town laid out with straight, wide streets.

*Buildings.*—Good civil hospital, built in 1913 ; Government school, started in 1911.

*Trade.*—Important trade-centre ; emporium for cattle and other trade with Darfur ; about 70 foreign merchants, mostly Syrian. Exports : gum, ivory, ostrich feathers.

*Inhabitants.*—The greater part of the residents belong to

the Hamar tribe, the remainder are Kaja Serug hillmen, and settlers from the Mima, Bederiya, Gawama, Manasra, and Beni Fadl tribes.

*Water-supply.*—From wells (600) ; apt to run short towards the end of the dry season.

**PORT SUDAN** (lat.  $19^{\circ} 36' 15''$  N., long.  $37^{\circ} 13' 30''$  E.). On the Red Sea coast, 36 miles north of Suakin ; 296 miles by rail from Atbara, 700 miles by boat from Suez.

Telephone ; Government wireless station with continuous day and night service, day range of 250 miles, call letters SUD ; submarine cable to Suakin.

*Population.*—In 1907 the population was 5,000, of which 1,000 were Europeans. There were then many workmen engaged on the harbour works and the present population is probably less by about 2,000.

*Description.*—Capital of Red Sea Province ; Residence of Governor ; site of Government offices ; garrison and police force.

The town is built of coral and lies to west of the harbour. It contains the Government buildings and institutions. These are as follows : Sudan Government Railway Hotel (formerly the P.O.) and the Hotel Jetty (formerly called Cromer Pier) ; a branch of the Gordon College of Khartoum ; a branch of the National Bank of Egypt ; Government school (with 59 pupils in 1913) ; American Mission school ; Red Sea Club ; a well-equipped modern hospital (with a British surgeon and accommodation for four first-class and twelve second-class patients, as well as natives) ; English church ; Greek church ; cotton ginning and pressing factory (worked by the railways) ; barracks ; prison.

The harbour was opened in 1906, and is under the control of the Sudan Government Railways Department. For a description of it, see p. 590.

*Trade.*—Increasing. For the principal exports and imports, see under 'Trade'.

*Health.*—Climate hot and damp ; fever prevalent. The water-supply is partly from wells near the town (e. g. those



of the Khor Mogg, 3 miles away, opened in 1913-14), partly from a salt-water condenser. This last has a maximum output of some 300 tons of water per day. Water is also derived from a sweet-water canal.

*Inhabitants.*—These are very mixed, Sudanese (Arabs and negroes); Arabs from the opposite coast; Egyptians, Abyssinians, and Indian merchants.

*History.*—Port Sudan was formerly known as Mersa Sheikh Barud (or El-Barghut), after the chief whose tomb, a white gabled building about 12 ft. high, stands on a slight eminence at the north of the entrance, and serves as a good sea-mark. It has only recently risen to importance, having taken the place formerly held by Suakin.

**ROSEIRES** (lat.  $11^{\circ} 51' N.$ , long.  $34^{\circ} 23' E.$ ). On the right bank of the Blue Nile, 402 miles by river from Khartoum. Altitude 1,540 ft. above sea-level.

*Description.*—Chief town of the district; Residence of Inspector, Mamur, and Inspector of Forests; local headquarters of Slavery Repression Department; garrison and one gun-boat usually stationed here. The Government buildings surround a square; an avenue of *tebedi* trees leads to the market; the *tukls* and mosque are of mud and stubble.

*Buildings and Institutions.*—Mamuria offices; hospital; police station; barracks; mosque (at entrance to market-place); elementary school; climatological station; customs.

The market is poor; there are one or more Greek shops; ebony is sold.

*History.*—Here Colonel Lewis and 400 men defeated Ahmed Fadil and about 3,000 men in 1898.

**RUFEEA.** On the right bank of the Blue Nile, 98 miles from Khartoum.

*Description.*—Chief town of a district; Residence of Inspector and Mamur. The houses are mostly grass *tukls*, and the population consists of Shukriya, Jaalin, and other Arabs. It is said to be the second largest town on the Blue Nile. There is a school.

**SENNAR** (lat.  $13^{\circ} 34' N.$ , long.  $33^{\circ} 35' E.$ ). On the left

bank of the Blue Nile, 223 miles from Khartoum by river, 168 by rail.

*Description.*—Chief town of a district ; Residence of Inspector and Mamur.

*History.*—Sennar, which had formerly been prosperous and important, was ruined by the Dervishes. Re-occupied by the British in 1898, and made for a few years capital of the Province.

**SHENDI.** On the right bank of the Nile, nearly opposite Metemma ; 472 miles by rail from Halfa, 86 miles south of the mouth of the Atbara.

*Description.*—Head-quarters of Shendi district ; Residence of Inspector and Mamur ; head-quarters of the cavalry (Sudan Army), on account of the fine grazing area surrounding it ; forage farm, run by the Supply Department of the Army ; agricultural centre. The town on first appearance looks as though it consisted of half-ruined hovels, but these are fairly comfortable inside, and well-peopled. There is a mosque.

*Trade.*—Shendi was formerly one of the most important commercial towns in the Sudan. Its present importance is on the increase ; it is an industrial centre, with cotton factories, dye-houses, and ironworks, and has bazaars, and a trade in grain.

*History.*—Formerly the capital of the ancient kingdom of Meroe. Destroyed by the Egyptians in 1823 in revenge for the murder of Ismail Pasha, son of Mohammed Ali, by the Jaalin. Taken by British troops in 1885, and again in 1898.

**SINGA (SENGA).** On the left bank of the Blue Nile, 281 miles by river from Khartoum, 121 from Roseires.

*Description.*—Capital (since 1905) of Sennar Province ; Residence of Governor. The Government buildings are of brick, the others mainly of straw.

*Institutions.*—Government rain farm ; *kuttab* (first class) ; civil hospital. There is a daily market. Native police corps.

**SUAKIN (SAWAKIN)** (lat. 19° 7' N., long. 37° 20' E.). On the Red Sea coast, 36 miles south of Port Sudan, with which it is connected by submarine cable.

Submarine cable also to Suez, Aden, and Jidda.

*Population.*—About 11,000 in 1914, about 6,000 in 1916. Decrease due to the transference of trade and importance generally to Port Sudan, a transference effected mainly in consequence of the difficulty of the Suakin entrance. There is a strong Indian element.

*Description.*—The town is divided into two parts, an old town and a modern. The former is built of white coral, and entirely covers Suakin Island, it consists of a broad, regular main street, with narrow, picturesque side streets, in which the bazaars are situated. The houses are well-built and lofty, in the Arab style; there are some uninteresting mosques. The public buildings front the sea. There are a civil and a military hospital, both open to natives, and a branch of the National Bank of Egypt. Suakin has also a primary school. The old town is connected by Gordon's Gate and Causeway with its suburb El-Kaf on the mainland. The latter is considerably the larger, and its dwellings are of lighter structure, mainly grass huts with compounds. There is a very fairly supplied bazaar. El-Kaf is surrounded by a high coral wall, and there is a line of forts a mile outside it.

The harbour is on the east side of the town. For a description see p. 594.

*Trade.*—Suakin is a trade centre for Tokar and also for Arabia. There is a cotton ginning and pressing factory. Salt trade is carried on with Ras Raweiya, and pearl-fishing is an important industry along the adjoining coast. For the chief exports and imports, see 'Trade'.

*Health.*—The climate is damp and unhealthy, the heat between June and September being terrific. Summer sandstorms are frequent, and sunstroke is to be dreaded. The administration is removed during the summer to Erkowit, 35 miles to west, on a plateau 3,000 ft. above the sea. The water-supply is derived from (a) the condensing apparatus on Quarantine Island; (b) a line of pipes from the Government waterworks in the Shata Gardens, about a mile outside the town; (c) some wells near these gardens.

*History.*—Suakin is an ancient settlement. Until the suppression of the slave trade, it was an important slave port. It is the point of departure for Sudan pilgrims to Mecca.

**TOKAR.** On the level mud plain at the northern end of the delta of the Khor Baraka; 56 miles by road south of Suakin, and about 273 north-east of Kassala.

*Population.*—This was stated in 1907 to be 3,000, but there is an enormous influx into the district during the cotton season, which probably increases it to 20,000–30,000.

*Description.*—Chief town of the Mamuria; centre of cotton-growing district. There are mud and straw huts, and bazaars, and a market-place, with merchants' houses. A large cotton store occupies a fenced enclosure. (See references to Tokar under 'Trade'.)

*Buildings.*—Fort, with barracks for garrison; Government offices; Government school (with 145 pupils in 1913); Zaptia prison; dispensary; police barracks.

*Health.*—Climate dry and healthy in winter; great sandstorms during the summer, when the climate is very unhealthy. The sanitary system was stated in 1913 to need improvement. The water-supply is from wells; the water of those in the fort is hard and in some instances brackish.

Tokar cotton trade would be greatly benefited by control of the Baraka flood and by railway communication.

**WADI HALFA** (lat.  $21^{\circ} 55' N.$ , long.  $31^{\circ} 19' E.$ ). On the east bank of the Nile, 949 miles by river, 578 miles by rail, north of Khartoum. Five miles south of the political frontier with Egypt, though an administrative enclave has been made to Faras Island, 20 miles to north.

Rest House.

Cook's office near the railway station.

*Population.*—2,675 (in 1914).

*Description.*—Capital of Halfa Province; official, residential town; a new suburb called Taufikia has been constructed.

*Buildings.*—Hotel; hospital; Government school for boys (opened in 1913, when it had 161 pupils); American Mission school; good stores; native bazaar, and market.

The *Camp* is about  $1\frac{1}{2}$  mile to south, and includes forts, barracks, prison, and a native quarter, as well as a ferry, P. and T.O. and quarantine station.

*Inhabitants*.—Barabra, Sudanese, Egyptians, and a large sprinkling of Greeks.

The water-supply is entirely from the river.

On the opposite bank are the ruins of the ancient Egyptian town of Behen (Buhen).

**WAD MEDANI** (lat.  $14^{\circ} 24'$  N., long.  $33^{\circ} 31'$  E.). On the left bank of the Blue Nile, 109 miles by rail and 127 miles by river from Khartoum, 275 miles by river from Roseires.

*Population*.—Over 15,000 (1916).

*Description*.—Capital of Blue Nile Province ; head-quarters of Wad Medani district ; Residence of Governor ; garrison (one battalion) ; large and important town. In 1905, it was described as 1 mile long by  $\frac{1}{2}$  mile broad.

The town is ancient, and consists of *tukls* with some fine buildings among them. There are good roads and boulevards, planted with trees, and embankments, wharves, and gardens.

*Buildings and Institutions*.—Barracks ; mosque ; branch of the National Bank of Egypt ; civil hospital ; Government school for boys with *kuttab* attached (with 159 pupils in 1913) ; girls' school (with accommodation for 100) ; climatological station.

*Trade*.—There is a large daily market, in addition to a Monday and Thursday market which is the most important, after those of Omdurman, in the whole Sudan. It is under Government control ; vegetables, sesame, oil, and native leather goods are exchanged for European wares. Wad Medani is a prosperous agricultural centre, and the grain dépôt for the Gezira. There are oil and soap works.

*Health*.—Sanitary improvements (e. g. concrete drain-pipes) were introduced in 1913.

*History*.—Founded by El-Fiki Medani about 1800 ; has now taken the position formerly held by Sennar.

To north of the town are the remains of an old mosque,

ruined by the Mahdi. About 1 mile to east of the town are the offices of the Irrigation Department.

**WAU** (lat.  $7^{\circ} 42' N.$ , long.  $28^{\circ} 3' E.$ ) 172 miles from the mouth of the River Jur, 898 miles from Khartoum.

Wireless was to be installed in August 1918. Mail partly carried by runners.

*Population.*—About 5,000 ; increasing.

*Description.*—Capital of Bahr el-Ghazal Province ; headquarters of a military district ; Residence of Governor.

*Buildings and Institutions.*—Official houses ; barracks ; prison ; mosque ; Austrian R. C. Mission station, with school ; climatological station. A number of brick stores have been opened by Greek and native merchants.

*Health.*—Very unhealthy, owing to mosquitoes, and the proximity of the river. There are two Syrian doctors.

The local tribes are mainly Nyam Nyam.

## APPENDIX I

### RECENT RELIGIOUS FANATICS

IN May 1916 Mohammed el-Nur Issa declared himself to be Nebi Issa in Sennar Province and attracted a few followers. He was suppressed.

IN December 1918 a party of 30 fanatics, mostly Hadendowa with a few Takari, attacked Kassala Fort.

They were beaten off and two of the ring-leaders, a Takruri and a Hadendowi named Mohammed el-Haj Sambou and Mohammed el-Haj Musa respectively, were amongst the killed.

The majority of this band were captured and tried and two of the ring-leaders, Hassah Mohammed el-Haj Musa and Bilal Mohammed were executed.

IN April 1919 Mohammed Ibn el-Said Hamid, nephew of the late Mahdi, living at Singa, announced that he was Isa. He collected a large following but on encountering a police force 40 of his following were killed and he himself with 43 others were captured.

Mohammed Ibn Said Hamid and three of his followers were tried and executed.

IN March 1920 a certain Fellata Fiki, named Haj Musa, travelled among the Hadendowa, Beni Amer and Arteiga tribes in Kassala Province declaring himself to be Nebi Isa. Late in April he proceeded into Eritrea and was arrested and deported to the Sudan for preaching religious war.

IN August 1920 a certain Sudanese named Adam proclaimed himself to be Nebi Isa in Kassala and was arrested.

## APPENDIX II

## RAILWAYS AND STEAMERS

THE following table shows the progress of the main branches of these services during the years 1915-19 :

	1915.	1916.	1917.	1918.	1919.
	£E.	£E.	£E.	£E.	£E.
<b>Railways—</b>					
Total revenue . . .	535,805	742,474	835,580	987,267	1,006,854
Expenditure . . .	326,259	454,813	541,696	744,751	765,997
Profit . . .	209,546	287,661	293,884	242,516	240,857
<b>Steamers—</b>					
Shellal-Halfa Reach—					
Revenue . . .	32,125	51,277	67,571	84,586	102,909
Expenditure . . .	32,261	39,992	54,667	55,299	52,451
Profit . . .	—	11,285	12,904	29,287	50,458
<b>Steamers—</b>					
Dongola Reach—					
Revenue . . .	9,370	9,675	11,700	11,559	12,111
Expenditure . . .	7,025	7,049	11,654	14,853	17,201
Profit . . .	2,345	2,626	46	—	—
<b>Steamers—</b>					
Khartoum and South—					
Revenue . . .	{ Only figures for 1918 are given, as this service was only amalga- mated with the others in 1918. }			135,069	125,651
Expenditure . . .				110,785	116,626
Profit . . .	—	—	—	24,284	9,025
<b>Port Sudan—</b>					
Dockyard and harbour—					
Revenue . . .	15,383	21,531	22,743	20,071	24,860
Expenditure . . .	16,659	20,350	21,761	22,927	32,499
Loss . . .	1,276	—	—	2,856	7,639
<b>Catering department—</b>					
Revenue . . .	—	—	—	15,418	20,446
Expenses . . .	—	—	—	17,352	21,182
Loss . . .	—	—	—	1,934	736
<b>Total—</b>					
Revenue . . .	592,683	824,957	937,744	1,253,970	1,292,831
Expenditure . . .	382,204	522,204	629,778	965,967	1,005,956
Profit . . .	210,479	302,753	307,966	288,003	286,875



*Railways*

The setback to trade, which was the first result of the outbreak of war, affected the railway traffic seriously. Much export traffic was lost, though this was in part due to the bad rains of 1913 and consequent diminution of the export of millet. The temporary suspension of the irrigation works in the Gezira also diminished the traffic receipts. By cutting down services, suspending all operations that were not absolutely essential, and by utilizing reserve stores as far as possible the early and difficult period was safely tided over.

The revival of prosperity in 1916 relieved anxiety as to the financial situation, but the difficulty of getting necessary stores and material, particularly coal, persisted till the end of the war.

The services of several members of the railway staff were lent for the campaign in Palestine. A certain quantity of rolling-stock was also spared with some difficulty for the same purpose.

It is a matter for satisfaction that in spite of these difficulties not only was the ordinary traffic of the country regularly and efficiently carried, but the unprecedented demands for camels, cattle, sheep and grain for Egypt were met without hitch or failure.

The most important consideration now is to make good deficiencies in permanent way, rolling-stock and river vessels, which have seriously deteriorated during the past five years.

There is urgent need for materials to relay the line between Halfa and Abu Hamed and some little way south. It is extremely difficult to obtain sleepers at a reasonable price, but expenditure on this item must be faced.

An allotment of £E140,000 was made from the general reserve fund of the Government in 1919 for the purchase of locomotives and wagons.

*Passenger Traffic.*—Receipts have risen in 1919 from £E120,544 to £E138,564.

*Goods Traffic.*—The total tonnage carried declined in this year from 288,136 tons to 206,888 tons. The decline is due

to the failure of the 1918-19 dura crop, the export of which declined from 87,990 tons to 13,309 tons.

Apart from this goods traffic has been satisfactory, the most noticeable feature being the unusually heavy date traffic.

### *Steamers*

*Nile Navigation.*—The Steamers Department which controlled the whole of the river traffic on the White and Blue Niles and their tributaries south of Khartoum, was incorporated with the railways on January 1, 1918.

The craft of the Department at the time they were taken over were in a condition which showed the strain caused by the exceptional difficulties and dangers of Nile navigation, and during the war it was impossible to undertake systematic renewals.

The plant and machinery of the Khartoum North Dockyard are inadequate, and there is a shortage of barges, specially for cattle. Twelve new barges are on order or in course of construction.

The general manager intends to proceed steadily with the renovation of craft, but anticipates that it will be some years before the service is in a fully satisfactory condition.

The traffic south of Khartoum has declined owing to the Gambeila (Abyssinia) export of coffee and import of salt being below the average.

Great difficulty has been experienced in keeping the Bahr-el-Ghazal free from sudd blocks, and much delay to steamers has been caused thereby.

On the Halfa-Shellal Reach renovation was undertaken from 1912 onwards, and this service is now thoroughly efficient.

*Port Sudan Harbour and Shipping.*—The Harbours and Lights Administration at Port Sudan was passed over to the Railways Department in 1914.

A wireless station was erected at Port Sudan, and the port was regularly used as a naval base and coaling station by His Majesty's ships.

Direct imports were very limited owing to the general shortage of shipping.

It is satisfactory to report, however, that adequate arrangements for homeward freights were made, and the Sudan has consequently disposed of its exports throughout the whole period of the war with no worse experience than moderate delay and partial congestion.

That such a successful result was obtained is due to the enterprise of the local shipping agents who received the assistance of the Government in securing due consideration at the hands of the shipping control authorities.

## APPENDIX III

### LANDS AND CONCESSIONS

As regards town lands, the director of the Lands Department has been gradually devolving the work of dealing with applications for allotment of lands on the local authorities. Land allotment in practically all towns and stations is now dealt with in this way, the Lands Department exercising supervision and control.

The Lands Department has the work of the following Committees to deal with :

1. The Gezira Development Commission. This committee deals with all questions arising out of the scheme for the cultivation of the Gezira by means of the Makwar barrage.

2. The Concessions and Projects Committee. This committee deals with all applications for concessions in the Sudan.

3. The Town Improvement and Allotment Board. This board deals with all questions regarding the disposal of land in Khartoum.

4. The Inundated Areas Committee. This committee deals with questions relating to the areas in the White Nile province which are to be inundated through raising the level of the river by the projected dam at Gebel Aulia.

## APPENDIX IV

## GAME PRESERVATION

THE following are the figures of game killed during the years 1914-18 :

	<i>Head.</i>
1914 . . . . .	3,580
1915 . . . . .	1,017
1916 . . . . .	426
1917 . . . . .	545
1918 . . . . .	1,368

Returns in 1919 show a total of 1,371 head of game killed by 130 officers, officials, residents and natives.

A number of modifications have been made in the game laws with a view to preservation of animals that are becoming scarce.

## APPENDIX V

## FORESTS

THE Sub-Department of Forests was of necessity greatly limited in its activity during the war owing to the necessity of diverting its staff to the control and organization of the fuel supply.

Early in 1918 the demand for wood fuel, owing to the high price of coal, became so great that considerable difficulty was experienced in obtaining adequate supplies from the forests on the White and Blue Niles. The question is largely one of transport, and the control of the whole supply of firewood was therefore placed by Government in the hands of the Railway Department. The forests in the immediate vicinity of Khartoum had been extensively cut since the re-conquest, and it was found necessary to make a survey of the remaining forest areas within 200 miles of Khartoum, both on the White and Blue Niles, and also in the Berber province. This was

completed during 1918, and a careful allocation was made to meet the requirements of the various interests during the present emergency.

Apart from this there has been a certain amount of progress in the exploitation of forest produce which has been regulated by licence since new Forestry Regulations were put into force in 1918.

The following paragraphs deal with the principal items of forest produce, including fuel :

*Timber.*—The total quantity obtained in the period amounted to 108,000 cubic feet, from the forests of the Bahr-el-Ghazal and the Lado.

*Firewood.*—The total quantity consumed was :

	<i>Kantars of 100 lb.</i>
By Government departments . . . . .	4,773,760
Private purchasers . . . . .	6,642,000
Total . . . . .	11,415,760

#### *Charcoal.*

	<i>Tons.</i>	<i>Value in £E.</i>
Exported to Egypt . . . . .	17,680	176,800
Used in the Sudan . . . . .	4,320	25,920
Total . . . . .	22,000	202,720

*Gum.*—The total value of gum exported amounted to 82,790 tons valued at £E3,311,600.

*Senna.*—The export trade in senna during the war amounted to 39,600 cwt., valued at £E114,446.

*Tannin.*—Owing to the supply of tannin being cut off from Asia Minor, Egypt was obliged to turn to the Sudan for her needs. The total quantity of 'garad' (pods of acacia arabica) exported to Egypt amounted to 86,306 cwt., valued at £E33,260.

#### *Kagelu Farm*

The management of the farm at Kagelu in the Lado was taken over in March 1915, principally as a rubber plantation and demonstration area.

The following is a résumé of the work :

*Rubber.*—The total area planted is 340 acres, and there are now 50,000 well established trees. In 1919 the 8,000 trees planted in 1915 were tapped for the first time and yielded 2 tons of dry rubber.

*Coffee.*—By the end of 1919 there were 4,200 bushes planted, chiefly of Liberian and Arabian varieties. Results show that coffee of good quality can be cultivated in the Lado on a commercial scale.

*Cassava or tapioca.*—This has been adopted as the chief food crop for the labour on the farm. The total area under this crop is 150 acres.

The following timber trees have been planted :

Lado mahogany.

Eucalyptus, several species.

Indian teak, seed from Burmah.

Indian red cedar, seed from India.

A great variety of fruit trees have been planted and have done well. All kinds of English vegetables have been cultivated with success.

Experiments have been made with tobacco, cinchona, cocoa, camphor, ginger, &c. The tobacco experiments have been a decided success. Cinchona is also likely to do well.



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